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### AMONG SHIP BUILDERS OF THE GREAT LAKES.

Vice-President Ireland and Messrs. Wallace and Fitzgerald, manager and assistant manager of the American Ship Building Co., met the president of the company, Mr. W. L. Brown, at Marquette, a few days ago, and reviewed the matter of distributing among the different consolidated yards the orders for twenty new steel vessels that are to be built during the winter. Mr. Brown seeks a retreat in the woods near Marquette about this time of year on account of hay fever. There will be no change from the program of new work laid out for the different yards some time ago, except that it has been decided to build the large car ferry for the Pere Marquette Railway, which is to cost about $360,000, at the Globe yard, Cleveland. As the car ferry is not to be delivered until October next, its construction will not interfere with the completion by the opening of navigation next spring of the three large freight steamers to be built at the Globe yard—two for Capt. John Mitchell and others, and one for Capt. Chas. L. Hutchinson and others of Cleveland. Chicago will have the large lake freight steamer that is to be built for Mr. C. W. Elphicke and others of Chicago, as well as the four steamers for Atlantic coast service that are being built for Chas. Counselman and others. The Lorain yard will have four of the six steamers to be built for J. C. Gilchrist and others of Cleveland, and the Detroit works two Gilchrist steamers as well as a freighter of about the same size for D. C. Whitney of Detroit. The two steamers for the Calumet Transit Co., of which D. R. Hanna of Cleveland is president, will be built at West Superior, and two steel barges for the same company at West Bay City. This leaves the West Bay City works as the only place where a keel or two could be put down with probability of delivery quite early next season. Orders for two or three more vessels will undoubtedly be secured before the present season is at an end, as considerable figuring is still going on.

Every effort is being made to send down to New York before the end of next month the steel steamers Paraguay and Asuncion with their two consorts. These are vessels building for Mr. A. B. Wolvin and others to engage in coastwise service on the Atlantic. They are all of Canadian canal dimensions and will probably carry full 3,000 tons each when on salt water. The Paraguay is afloat at Lorain, and it is expected that the Asuncion will be launched on Saturday next. The barges, which are building at West Superior, are not yet launched, but it will not take long to fit them out after they are in the water.

Mr. John Craig of the Craig Ship Building Co., Toledo, says he is not anxious for an order for another new vessel unless the price is such as to admit of a very fair profit. He says his company will be quite fully employed during the winter, anyhow, as they have a freight steamer of Canadian canal dimensions to build for the Messrs. Hawgood of Cleveland, and a small passenger steamer for the Booth Packing Co. A Sandusky report is to the effect that negotiations are pending for the sale of the steamer American Eagle of that place to the Craig company in part payment for a larger steel passenger steamer to be completed by the Craig company by June next.

It is expected that the 6,000-ton steamer, Capt. Thomas Wilson, building at the works of the Jenks Ship Building Co., Port Huron, will be ready for service in about two weeks. The keel has been laid at the Jenks yard for the steamer of Canadian canal dimensions which the company is to build during the winter on its own account.

### PIG IRON PRODUCTION IN CANADA IN 1900.

The production of pig iron in the Dominion of Canada in the first half of 1900, according to reports which have been received by the American Iron & Steel Association from every manufacturer of pig iron in the Dominion, amounted to 45,234 gross tons. The total production in the whole of 1899 amounted to 94,077 tons, against 68,755 tons in the whole of 1898. Of the production in the first half of 1900 about one-sixth was made with charcoal as fuel, the remainder being produced with coke alone. In the first half of 1900 Canada produced both Bessemer and basic pig iron, two companies manufacturing Bessemer pig iron and one company manufacturing basic pig iron. The production of Bessemer pig iron was about one-third of the production of basic pig iron. Neither spiegeleisen nor ferromanganese was produced in Canada during the first half of 1900, the Mineral Products Co. of Hillsboro, New Brunswick, having given up its lease of the Bridgeville furnace, at Bridgeville, Nova Scotia. The furnace was blown out in November, 1899. This company will confine its operations to the production of manganese ore. The furnace was idle from November, 1899, to June 30, 1900. The unsold stocks of pig iron in Canada on June 30, 1900, in the hands of manufacturers or their agents, none of which was intended for consumption by the manufacturers, and all of which was for sale, amounted to 13,672 gross tons, against 9,932 tons on December 31, 1899. The number of completed blast furnaces in Canada on June 30, 1900, was nine, of which four were in blast and five were out of blast. On Dec. 31, 1899, there were also four furnaces in blast and five out of blast. Of the total number of furnaces in Canada four use coke as fuel, four use charcoal and one used charcoal and coke when last running.

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According to the Italia Militare e Marina, the new Italian battleships will each have a displacement of about 12,000 tons, and the principal armament will comprise two 12-in. and twelve 8-in. guns, besides subaqueous torpedo tubes. Their speed will be high, from 20 to 22 knots, and the armor protection will be complete. The same journal describes the Saint Bon as a superb ironclad of the very latest type, armed with four guns of 254 mm., eight of 152 mm., eight of 120 mm., besides twenty-two of smaller caliber, and four torpedo tubes. Her vertical armor defending the water line is described as "imperforable," and the machinery and other vital parts of the Saint Bon are shielded by armored decks. She carries three great projectors—two à fleur d'eau, and one at the masthead.

### TRADE WITH PORTO RICO.

Four months' operation of the Porto Rican tariff law show an increase of more than 100 per cent. in our exports to that island as compared with the corresponding months of 1899, and more than 300 per cent. as compared with the corresponding months of 1897 or 1896. The act went into effect May 1, 1900, so that the figures for August, which have just been completed by the treasury bureau of statistics, complete the record of the fourth month of commerce between the island and the United States under the new law, and render practicable a comparison of the four months' term with corresponding periods in preceding years. The corresponding four months in 1899 cover a period in which the island was under the American flag, but subject to the customs laws of the United States which relate to foreign countries. The corresponding four months of 1898 were the war period and do not therefore furnish a fair basis for comparison. The corresponding four months of 1897 and 1896 present normal conditions in the commerce between the United States and the island when it was Spanish territory.

It is therefore now practicable to contrast the commerce between the United States and Porto Rico during four months' operations of the new law with a corresponding period prior to the enactment of this law when the island was under the American flag, and also with corresponding periods when the island was Spanish territory, and to determine whether the enactment of the new law was followed by an increase in our commerce with the island. It will be remembered that the discussions in congress a few months ago and the statements made by delegations from and officials in the island indicated that the island had, as a result of the storm of August, 1899, practically nothing to sell and nothing with which to buy, and it was supposed that the first few months under the new act would necessarily show a reduction in the exports and purchasing power of the island as compared with the corresponding period in former years. It is the more surprising, therefore, to find that the island has during the four months since the enactment of the law sent to the United States $3,250,000 worth of her exports, as against $1,984,000 worth in the corresponding months of 1899, $1,183,000 in the corresponding months of 1897, and $1,360,000 in the same months of 1896; and that its people have been able to purchase from the United States during that period $2,525,000 worth of our exports, against $1,132,000 worth in the corresponding months of 1899, $629,000 worth in 1897 and $587,000 worth in the corresponding months of 1896. A table prepared by the treasury department shows the imports from and exports to the island, in its commerce with the United States during May, June, July and August of 1896, 1897, 1899 and 1900. Every month since the enactment of the new law shows a marked increase over 1899 and a still greater increase as compared with 1897 and 1896; while the total imports from the island in the four months of 1900 show an increase of 63 per cent. over 1899 and 174 per cent. over 1897, and the exports show an increase of 123 per cent. over 1899 and 301 per cent. over 1897.

### CARGO RECORDS OF LAKE FREIGHTERS.

The large cargo of wheat, corn and oats moved from Manitowoc to Buffalo a few days ago by the Rockefeller steamer General O. M. Poe was not by any means the largest grain cargo ever moved on the lakes. The record cargoes are probably done with for this season, as the draught of water in connecting rivers of the lakes will be on the decrease for the balance of the year. The Poe's cargo was not as large as that of the Douglas Houghton of the same fleet loaded at the same port earlier in the season, but it was nevertheless a very big load. It consisted of 64,000 bushels of corn (1,792 net tons), 225,700 bushels of oats, mostly clipped (4,063 tons), and 50,500 bushels of wheat (1,515 tons), or a total of 7,370 net tons. The cargo of about 230,000 bushels of corn just loaded by the Wilson line steamer Andrew Carnegie at Chicago is probably the largest load of corn ever taken aboard a vessel in the Chicago river, but it is, of course, understood that the big vessels are at a disadvantage on account of limited harbor draught when loading in Chicago. At South Chicago last season the steamer Superior City of the American Steamship Co. loaded 266,550 bushels of corn, equal to 7,463 net tons.

The steamer William Edenborn of the American Steamship Co.'s fleet now shares the honor of record cargo in the ore trade with the steel tow barge John Smeaton of the Rockefeller fleet. The Edenborn delivered at Conneaut from Two Harbors, a short time ago, 7,446 gross or 8,339 net tons of ore, including the 1 per cent. above bill of lading weight which the ship always carries on account of moisture. This load is exactly equal to one which the Smeaton moved last season from Duluth to Cleveland. A summary of cargo records corrected to date follows:

Iron ore—Steamer William Edenborn, A. B. Wolvin of Duluth managing owner, 7,446 gross or 8,339 net tons, Two Harbors to Conneaut; tow barge John Smeaton, owned by Bessemer Steamship Co. of Cleveland, 7,446 gross or 8,339 net tons, Duluth to Cleveland, draught 18 ft. 1 in.; tow barge Manila, Minnesota Steamship Co. of Cleveland, 7,399 gross or 8,237 net tons, Two Harbors to South Chicago, draught of 18 ft.

Grain—Steamer Superior City, A. B. Wolvin of Duluth, manager, 266,550 bushels of corn, equal to 7,463 net tons, South Chicago to Owen Sound, draught of 18 ft. 2 in.; steamer Douglas Houghton, Bessemer Steamship Co., 308,300 bushels of clipped oats and 60,000 bushels of corn, equal to 7,538 net tons, Manitowoc to Buffalo.

Coal—Steamer O. M. Poe, owned by Bessemer Steamship Co. of Cleveland, 6,585 net tons of bituminous, Erie to Duluth; steamer Hendrick S. Holden, Capt. John Mitchell and others, Cleveland, 6,432 net tons of anthracite, Buffalo to Duluth, on a draught of 17 ft. 4½ in.

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Congressman-at-large Davenport of Erie, Pa., is framing a bill asking congress to appropriate $10,000 for the purpose of raising the Niagara, Commodore Perry's flagship. The ship is lying in Erie bay in 20 ft. of water, and divers report that the lower portion of the hull is intact.

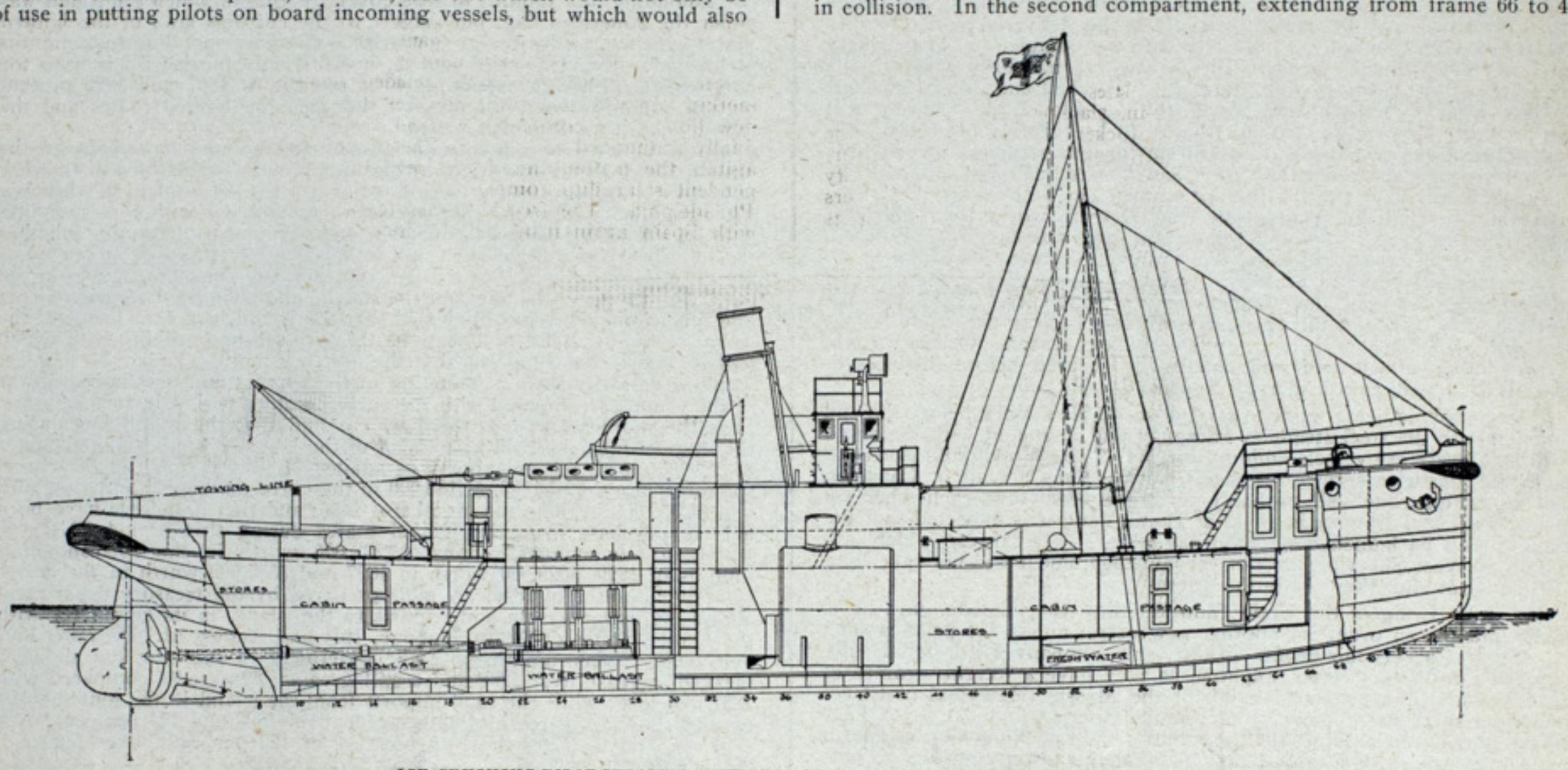
## SHIP BUILDING IN GERMANY.

ICE-BREAKING PILOT STEAMER BUILDING AT KIEL FOR SERVICE AT THE KERTSCH, WHICH CONNECTS THE BLACK SEA WITH THE AZOF.

BY GEO. CROUSE COOK.

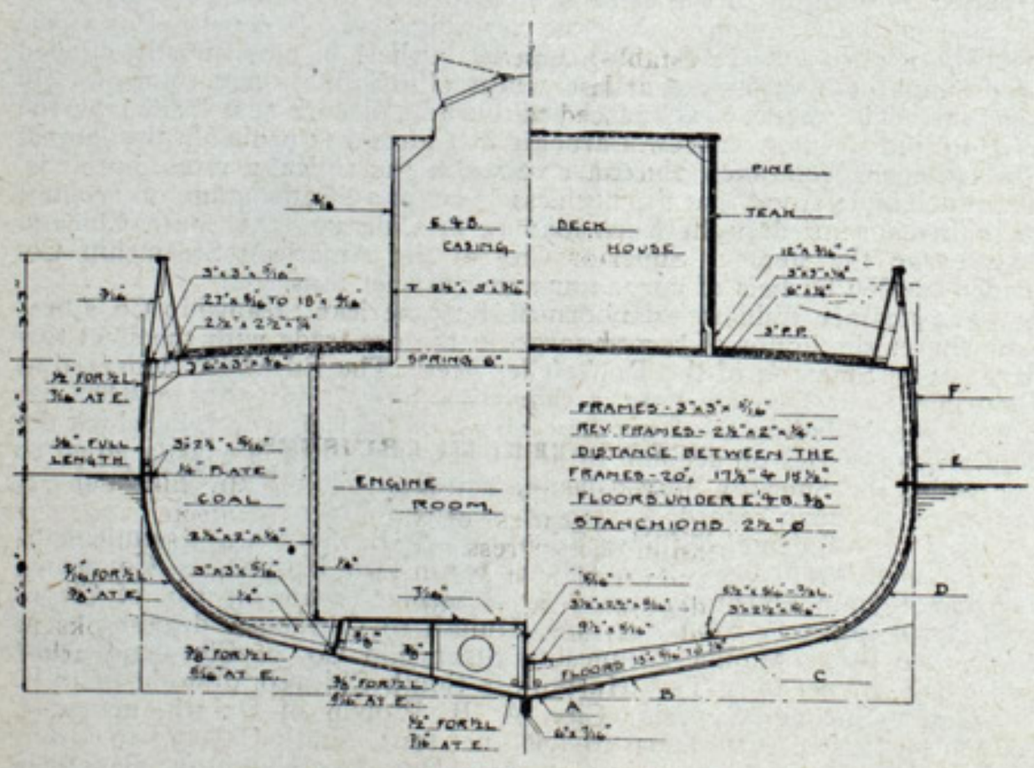
Mr. George Crouse Cook, a young American who is profiting by practical connection with ship building practice in Germany, favors the Review with another article from the Howaldtswerke at Kiel, Germany. He describes an ice-breaking pilot steamer building there for the Kertsch-Jenikal'schen Pilot Co. of Russia. The plans are by Mr. Cook.

"The Kertsch," from which the Russian company takes its name, is the passage to the east of the Crimea peninsula connecting the Black sea with the Azof. This passage is frequented by cargo and passenger steamers, particularly the former, which carry much of the enormous wheat product of southern Russia out from the ports on the Azof through the Kertsch to the Black sea and then to the world. The climatic conditions are those of extreme heat and cold. During the winter season the Kertsch is often covered with ice. The passage of vessels is frequently blocked. The kind of steamer required, therefore, was one which would not only be of use in putting pilots on board incoming vessels, but which would also




ICE-CRUSHING PILOT STEAMER BUILDING AT HOWALDTSWERKE, KIEL, GERMANY.

insure continuous service for these vessels throughout the year by crushing ice in the channel and by being suited also to towing purposes. Accommodations suitable for officers of the company, quarantine or custom officials were also required. The following design, independently based on elemental principles drawn from these requirements, conditions and surroundings, was decided upon: Length over deck, 120 ft.; length between perpendiculars, 116 ft.; beam, 24 ft.; depth, keel to deck, 10 ft. 9 in.;




ICE-CRUSHING PILOT STEAMER.

maximum draught, 8 ft. 9 in.; displacement, 270 tons; normal horse power, 350; normal speed, 10 knots; forced horse power, 520; forced speed, 11 knots; coal supply, 31 tons.

The ship has one pole mast forward with one staysail and one trysail; one funnel; a short forecastle deck bearing anchor windlass; a deck house extending for about one-half length amidship, with bridge and chart house at forward end, and a powerful searchlight standing on the chart house. The two main boats are swung from davits on the sides. A dingy is placed on the deck aft and handled by a boom which rises from the deck at the after end of the deck house. A towing hook and associated gear is fitted on the after end of the deck house. Under the forecastle are divisions for ship's stores, lamp room, water closets for pilots and crew, galley and entrance to forward accommodations. The greater portion of the deck house merely forms a casing for engine and boiler and is built of steel, but in the extreme after part, which is of wood, is the entrance to the officers' cabins, fitted with sofa, table and a water closet. On starboard side of the casing, at frame No. 30, is a steam pipe tank, giving a constant supply of hot water for warming drinks, etc. In appearance the hull is long and powerful. The actual freeboard is not great, but a deep continuous bulwark is fitted, which gives protection in heavy weather, and which is carried up to the height of forecastle forward in an easy curve. In the sides of the forecastle are hawse pipes for patent stockless anchors.

The hull is subdivided into seven transverse water tight compartments by six water tight bulkheads. Five of the bulkheads are integral, while the sixth, between engine and boiler room, is cut for two water tight swinging doors. The forward compartment, which is divided by a non-water tight bulkhead on frame No. 69 for a chain locker, stands for safety in collision. In the second compartment, extending from frame 66 to 48 (where a light wooden deck is fitted about 6 ft. 6 in. down from main deck), are accommodations for the captain, engineer, four sailors, two firemen and ten pilots. These rooms are reached by a companion way under the forecastle and are lighted naturally by side lights and combination ventilators and deck lights. Under the cabin floor is a fresh water tank with leads to galley, pantry, etc. The third compartment is for general stores and is reached by a large hatch in the main deck. The stores are handled by a boom on the mast, which is operated by a steam winch capable of lifting 2½ tons.

The fourth compartment is occupied by the boiler and subdivided by non-water tight longitudinal bulkheads, which form coal bunkers to port and starboard. In after port corner of this compartment is an "escape" to a hatch in the main deck, to be used in event of the usual exit, which is by ladder to a door in the side of the deck house, being rendered useless by accident. From the boiler room a water tight door in the bulkhead on frame 30, which is carried to the top of deck house, leads to the fifth compartment, the engine room. In this compartment a double bottom is fitted to give exceptional strength for engine base and also to withstand the shock resulting from a rush against. This tank is also to be used for water ballast purposes. A water tight box is built out from the engine room after bulkhead on frame 21 for the thrust block and its foundation. The engine room is connected with the "escape" by a water tight swinging door.

In the compartment from frames 21 to 9 are the official accommodations, consisting of three cabins, each fitted with berth, washstand, etc.; also a pantry and mess room supplied with the usual fittings and all reached by steps from the deck house. These accommodations rest on a steel water tight flat, about 6 ft. 6 in. down from the main deck, which forms, with the skin and limiting bulkheads, a large water ballast tank, independent of that under the engine. The after compartment is a receptacle for general stores and is divided by a non-water tight bulkhead on frame 5. Each section is entered by hatch in main deck. The stores are shipped by the boat and cargo boom, which is operated by a hand winch of 1½ tons power. The rudder stock is protected from the ice, when the vessel is moving backwards for a charge upon the ice, by a cast steel hood.

The disposition of displacement is that given by the two mathematical curves, versine and trochoid, which are generally acknowledged to give form of minimum resistance. The lines of the vessel are faired roundly in every direction that it may not be easily nipped by the ice. The profile of the stem is cut away from the bow to frame 4, that the ship, when rushing forward against ice, may mount upon the field, crushing it down. This quality is increased by the after trim afforded by the great ballast tanks. The after body above the water line fills out rapidly, so that a great trimming moment is created when the stem is driven up on the ice field. This moment, acting with the length of the boat as a lever, gives

a tremendous crushing force under the stem and is depended upon to keep the Kertsch open in the most severe weather.

The engine is of triple expansion type. One single-ended Scotch boiler supplies steam, developing under normal draft 350 H.P., and with the forced draft fan running 520 H. P. In the engine room is an electric plant for lighting the ship completely; also a large centrifugal pump, connected with the ballast tanks and which can empty these in a few minutes.

Some interesting particulars of the hull, which is to be built throughout of Siemens-Martin steel of German-Lloyd proof, are taken from the specifications. Stem and rudder frame are of wrought iron and stern frame of cast steel. The keel is formed of a vertical through plate 22 in. deep, supported on lower edge by two 6-in. flat pieces. Along the upper edge are two 3x2½ in. continuous angles, connecting the middle plate with two 10-in. horizontal side plates, which rest on the floors. Floors are fitted on each frame 13 in. deep, with a 2-in. flange on upper edge. In engine room the floors are carried to inner bottom and lighted by punched manholes. The inner bottom is laid with ½-in. plating.

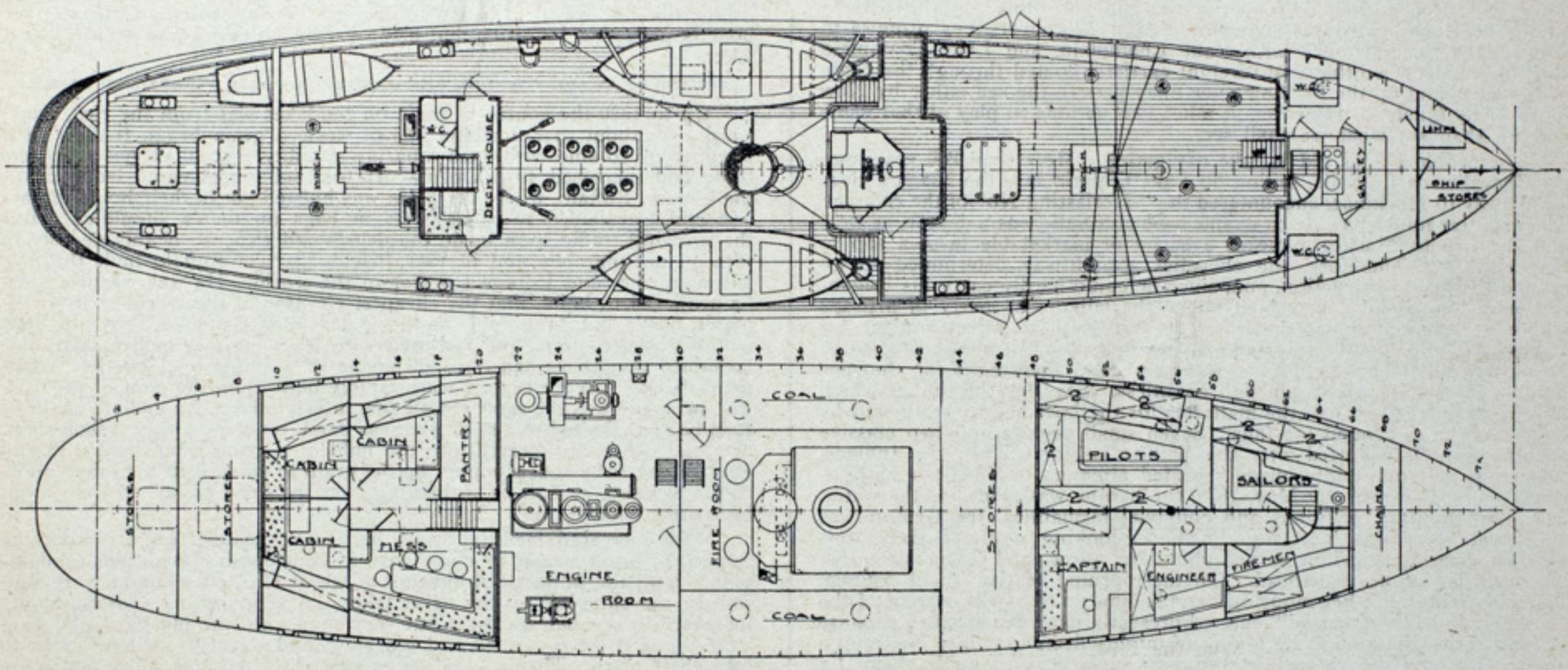
The frames are 3x3-in. angle, and to give additional strength forward against ice the frame spacing is reduced 2 in. from the normal forward of frame 45, and a second 2 in. from frame 63 to the stem. The reverse frames are 2½x2 in. and extend to bilge and main deck alternately. Two keelsons are fitted—a bottom keelson of two 3x2½-in. angles, with a bulb plate for two-thirds of length, and a second keelson at the water line formed of 3x2½-in. angles and intercostal plates.

The water tight bulkheads are of ¼-in. plate, excepting the lowest plate of each bulkhead, which is 1-8 in. thicker. These bulkheads are stiffened by horizontal and vertical angle stiffeners 4x2½ in., which overlap, and are riveted to the boundary bar, so as to give sufficient rigidity to withstand the test of filling compartments with water. Coal bunkers are to be built of ¼-in. plating, stiffened by 2x2½-in. angles; the sides and flooring of the bunkers to be lined with 2-in. battens.

Main deck beams (on alternate frames) are of bulb angle 6x2½ in and connected to frames by knee plates. The forecastle deck beams are angles of 4x3 in. The main deck stringer is 24 in. wide, reduced slightly at ends of the ship. A 14-in. gutter is formed by the 3x3-in. stringer angle and a 2½x2½-in. angle, which forms the boundary of 3-in. wood deck planking. Over the boiler a complete steel deck is laid, which is carried to the ends by 6-in. tie plates.

The shell plating, as shown on the midship section, is of the greatest possible lengths. All the plating in the water line is of additional thickness to withstand shocks from ice. The plating in and above the water line is connected by butt straps and under the water by butt laps. All are double riveted. The engine and boiler casing is built up of light steel plating. The after deck house is of pitch pine, faced with teak, on a steel frame. The chart house is built of teak. The hull is to have a thorough painting inside and out and the bottom laid with cement.

The keel of this vessel was laid in the latter part of July and all frames are set up at time of writing. The launch will take place about Oct. 1, and about two months later the vessel will start on her journey to the Black sea.




ICE-CRUSHING PILOT STEAMER BUILDING AT HOWALDTSWERKE, KIEL, GERMANY.

### AGING OF TRANSFORMER IRON.

The General Electric Co. is distributing a ninety-two page pamphlet on the subject of "Aging of Transformer Iron," containing five important articles that have been issued regarding this subject, as follows: "The Aging of Transformer Iron" by Prof. W. Elwell Goldsborough; "On Slow Changes in the Magnetic Permeability of Iron," by Mr. W. M. Mordey; "Effects of Prolonged Heating on the Magnetic Properties of Iron," by Mr. S. R. Roget, B. A." "Hysteresis in Sheet Iron and Steel," by Mr. Arthur Hillyer Ford, and "The Aging of Transformer Steel," by Mr. J. A. Capp. This pamphlet is one that should be in the hands of every central station manager, and will be furnished free of charge upon application to the General Electric Co.

The Shipbuilding, Drydock & Wrecking Co. of Collingwood, has changed its name to the Collingwood Ship Building Co., Ltd.

### NEW STEAMSHIP SERVICE SOUTH.

The Merchants & Miners Transportation Co. of Baltimore will establish a steamship service between Philadelphia and Savannah, beginning Oct. 1. The vessels will sail regularly from Philadelphia every five days, the Berkshire and the Allegheny of this line having been selected for the new service. Both steamers are large freight and passenger transporters of 3,000 tons, and have recently been overhauled at an expense of $125,000, and are modern in every respect. Other steamers will be added as required by the development of business. Arrangements have been made to connect at Philadelphia with all the trunk lines and at Savannah with all the railroads diverging from that port. This will enable the company to give through rates and through bills of lading between Philadelphia and interior eastern points and Savannah and all other points in the south, southeast and southwest. Arrangements have also been made for through package cars from Savannah to important competitive points in the south, southeast and southwest, which, with fast through freight schedules, should result in satisfactory service. Carroll H. Smith is the Philadelphia agent, with headquarters at Pier 24, South Delaware avenue.

The Ocean Steamship Co., operating between Philadelphia and Savannah, withdrew its steamers July 1, 1897. This action caused considerable excitement among merchants and manufacturers shipping goods south, and led to a protest meeting at the Philadelphia bourse. A committee was appointed, which included representatives from every commercial organization in the city, for the purpose of trying to establish a new line. This committee worked several months without success, and finally abandoned the effort. The trades league, however, continued to agitate the matter and began negotiations, hoping to induce an independent steamship company or some already established line to enter Philadelphia. The freight committee of the trade league after the war with Spain again instructed its freight commissioner, N. B. Kelly, to begin work toward the establishment of a line south. He visited most of the important cities and at last the Merchants & Miners' Transportation Co. of Baltimore was induced to establish the present line, after receiving promises of co-operation from the Pennsylvania, Baltimore & Ohio and the Reading Railroad companies. The Merchants & Miners' Co. has had an agency in Philadelphia since the Ocean company left and has secured considerable business for vessels sailing from Baltimore for Savannah. The company feels that with the aid of the railroads and the merchants it will be assured of a profitable business at once, and it is the belief of business men generally that the success will be so great that other steamers will be needed in a short time, leading to the establishment of a semi-weekly service.

### THE NEW PROTECTED CRUISERS.

Secretary Long has approved the circular prepared by the board of construction prescribing the features of the three protected cruisers authorized at the last session of congress. The three vessels are to be of 9,000 tons displacement and are to cost $2,800,000 each. The question that awaited the secretary's decision was the amount of armor to be fitted to these ships. He concluded to accept the majority view which looks to side armor in addition to the protected deck, which has heretofore marked the full amount of armor supplied to a protected cruiser. The new ships are to be the speediest in the navy, the minimum speed requirement being 22½ knots. Rear Admiral Hichborn dissented from the majority report. He thinks that the new vessels outlined in the circular are really armored cruisers.

### STEEL BARGES FOR MISSISSIPPI.

A tug to be used in the new Mississippi steel barge line projected by Alexander McDougall of whaleback barge fame, was launched last week from the sectional dock at Carondelet, St. Louis. The tug is constructed entirely of steel and is 138 ft. long. President H. S. Potter of the barge company and Vice-President Alexander McDougall witnessed the launch. One of the company's barges will be launched Oct. 15.

## A SHORT HISTORY OF THE LAKES

INVOLVED IN AN ENTERTAINING AND CORRECT ACCOUNT OF THE ASTONISHING DEVELOPMENT OF AMERICA'S GREAT FRESH WATER FLEET.

Mary D. Hartt in Boston Transcript.

All good Americans boast of the greatness of the great lakes; but few possess the data to make good their boast. Most of us need a dose of statistics, now and then, as a tonic to patriotism. We need to tell ourselves over again that our five lakes with their connecting waterways have a water surface of 95,000 square miles; that the coast lines of the system enclose more than half the fresh water area of the globe; that from Duluth on the west to Ogdensburg on the extreme east is 1,279 miles. Let us recall that "through this mid-continental waterway passes a commerce of greater magnitude than all the coastwise commerce of the states bordering on the Atlantic and the Gulf of Mexico;" remembering, too, that unlike the merchantmen of the Atlantic seaboard, the ships of the great lakes are built from American designs for American owners by American capital employing American labor, and are manned by American seamen and carry American produce. Armed by this impressive array of facts, who shall convict us of empty boasting?

Commercially speaking, there are but four great lakes—Superior, Michigan, Huron and Erie. Lake Ontario, linked by the Niagara into the quintet of waters, is at the same time divorced from it by the impassable rapids and cataracts of the river's course. Only little fishes go that way into Lake Ontario. On the other hand, the "hydraulic staircase" of the Welland canal, built to circumvent the difficulty, acts as a sieve to keep out the bigger lake craft. The Canadians are planning to change all that. They will deepen their 14-foot channel and substitute for the present twenty-five locks two huge pneumatic ones. Moreover, they propose to connect the St. Lawrence with Lake Champlain, and Lake Champlain with the Hudson, so that giant freight carriers, floated through the chain of the lakes and up the St. Lawrence, may pass to the sea either by New York or by Quebec. However, it takes two nations to play at that game and we shall see what we shall see.

The problem is as old as lake navigation. More than 200 years ago the Chevalier de La Salle, sailing up Lake Ontario into the Niagara river on his way to Mackinac, encountered the "Everlasting No" of the cataract. The explorer might have been daunted, but La Salle was a debtor, as well, and the trip to Mackinac meant a cargo of marketable furs—a sop to his creditors. Therefore, the chevalier straightway determined to go around the giant obstruction, and, since he could hardly carry his brigantine with him, build a new boat above the falls. The party of artisans whom he sent out under the Sieur de La Motte to select a place for a ship yard, fixed upon a safe and convenient spot at the mouth of Cayuga creek, five miles above the falls, and there laid the stocks for the new barque. Obstacles were well nigh countless. Save for the timber which was felled on the spot, all the materials for the boat had to be carried by hand nine miles around the falls. Seven small cannon and two massive anchors were transported after this painful fashion. Then the Indians, suspicious and unfriendly, made repeated attempts to burn the half-finished craft. However, by May, 1679, the barque was ready for the water, and, amid military, religious and convivial formalities, the Griffon was set afloat. She was a strange mediæval-looking craft of sixty tons burthen, bearing a griffin carved about her prow, and flying an eagle-blazoned flag at her masthead. On the morning of the 7th of August, 1679, the Griffon left her moorings, and sailing up the swift current of the "streight above the great fall" entered presently upon the unsailed expanse of Lake Erie—the modest harbinger of mighty fleets to come. Without a chart, with only the vague warnings of the Indians to guide them, La Salle and his crew of thirty men proceeded fearfully up the lake, sounding as they went. On the 25th a furious gale swept down upon them and raised so great a sea that the party on the Griffon gave themselves up for lost. All betook themselves to their devotions except the pilot, who "did nothing but curse and swear against M. La Salle, who had brought him thither to make him perish in a nasty lake and lose the glory he had acquired by his long and happy navigation on the ocean." However, the gale soon abating, the wrathful pilot worked his ship successfully across the "nasty lake" and came safe to Mackinac. Here the Griffon was loaded with valuable furs and with a crew of six men started back to Niagara. But she never came to port, nor is anything known of her fate save that two days after she sailed a great storm burst over the lakes. Doubtless the brave little bark succumbed to its fury, thus becoming the first wreck as she had been the first vessel on the inland seas.

### EARLY STAGES OF STEAM NAVIGATION.

We have no record of the building of any more vessels by the French, but after the surrender of Niagara to the English, in 1763, both trading vessels and ships of war were launched on the lakes. The war of 1812 placed two fleets of swiftly built boats upon the great waterways between Canada and the United States, but that picturesque story is unfortunately not a part of the history of lake commerce. It was not until 1818, 139 years after the wreck of the Griffon, that the next step in the evolution of lake craft was taken, and steam followed sail. In that year the first side-wheel steamer, the Walk-in-the-Water, was built at Black Rock, near Buffalo, for freight and passenger service to Detroit and the upper lakes. She was a comical-looking craft of 338 tons burthen, rigged with two masts and sails, with no guards except at the wheels, no bulwarks aft, and no upper deck. Her engine, a low-pressure, square cross-head affair, was not powerful enough to stem the swift current of the Niagara river. Therefore her captain was obliged at each sailing to employ a "horn breeze" (fifteen yoke of oxen) to haul her up the "rapids" into the lake where she could take care of herself. For something less than four years the Walk-in-the-Water ploughed the inland seas. Then one dark night, just after she had left port, a heavy gale drove her back to seek shelter in the river. Harbor there was none nor harbor light. In the pitchy blackness the little steamer failed to make the mouth of the Niagara, but was forced to cast anchor off Buffalo. Toward morning her hempen cables parted, and she dragged ashore at the foot of Main street, a hopeless wreck. When her enterprising owners began to talk of replacing her a keen rivalry sprang up between Black Rock and its suburb, Buffalo, for the honor of possessing the ship yard. Buffalo at last prevailed, upon condition that she would deepen her harbor sufficiently to float the craft. When the time for the launch arrived the villagers, fearful that the paid work upon the channel had not been thorough enough, turned to with pick and shovel and themselves dug out a clear passage for the new ship—the Superior. That was the home-made beginning of the finest harbor on the lakes.

Following the Superior, launched in 1825, came a long line of side-wheelers. The great movement toward the west had begun to make transportation lines both necessary and profitable. Not only western emigrants and their household effects, but supplies of all sorts for the pioneering communities went west by the lakes. It was an era of experiment in the building of steamboats. Each new boat was built on a new model. There were round prows and narrow prows, flat bottoms and deep keels, low-pressure engines and high-pressure engines, vertical engines, walking beams and square cross heads, one smoke stack, two smoke stacks, three smoke stacks. It was even said that so great was the divergence in machinery that the shore folk could recognize a steamer in a dense fog by its individual wheeze and cough. Low-pressure engines were at first the more popular because they were considered more safe. A pressure of 30 to 40 lbs. of steam was regarded as most hazardous. Now we do not think 250 lbs. too much.

In 1841 a new type of vessel appeared upon the lakes. The Vandalia, a screw propeller, built at Oswego, passed up through the Welland canal in that year and excited great curiosity on Lake Erie. She was, to quote an eye-witness, "an uncouth little craft, sloop-rigged, with smoke stack extreme aft, surmounted by a huge wire bonnet emitting a continuous volume of smoke, fire and cinders, together with an unearthly rasping noise." Propellers began at once to be built in considerable numbers for the freight trade, and they flourished side by side with the paddle-wheels until 1856, when, the railroads having stolen away most of the passenger traffic, the side-wheelers began to decline. Today many a Chinese river boat is propelled by an engine made in the fifties for use on the great lakes.

### COURSE OF TRADE TURNS TO THE EAST FROM GRAIN FIELDS AND MINES.

Up to 1830 the course of trade on the lakes was from the east, westward. At about that time the tide of western grain began to flow east, swelling in volume with such amazing rapidity that in eleven years the trade had increased 40 per cent. At first schooners came laden down the lakes to Buffalo, where the grain was hoisted out of their holds in barrels and transferred to canal boats in bags on men's shoulders! But the growing traffic soon made the delays and expense of this pedestrian method unendurable, and in 1841 Joseph Dart of Buffalo built the first steam transfer and storage elevator in the world. He was warned when he proposed to build, that the cheapest elevator in the world is an Irishman's back; but time told another tale. Boats unloaded by the new method cleared light, and returned with fresh cargoes before their old-fashioned neighbors had done disposing of a single load by the "Irishman's back." New elevators were rapidly built upon the plan of the first. The principle was the same simple one in use today. An endless chain of steel buckets, bolted to a strong canvas band, revolves within a steel shaft, or "leg," which is lowered into the hold of a grain-laden boat. Round goes the bucket-band, scooping up the grain to carry it to the lofty cupola of the elevator, and there, in turning over the head pulley, to toss it out into great bins.

With increased facilities came increasing trade. Iron ore from the Superior region began to come east in considerable quantities, and together with the immense shipments of wheat effected a complete revolution in the shipping on the great lakes. At first sailing vessels rapidly increased in number and size; but very soon even the big new schooners were found to be too small and too slow, and steam propellers began to take their place. Then as the shipments of ore became more and more heavy, wooden vessels were superseded by great ships of steel. In 1886 only six steel ships plied these waters. Now the bigger boats are all of steel and even canal barges are being built in that material. The vicissitudes of storm on the lakes having convinced ship builders that navigation on them is at least as dangerous as on the Atlantic coast, 90 per cent. of the vessels turned out by the ship yards are practically sea-going craft. Most of the ships built in 1899 (total value $10,500,000) were steel steamers, 450 to 500 ft. long, of 7,000 to 8,000 net tons capacity, equipped with triple expansion and quadruple expansion engines of 1,800 to 3,000 H.P., and in most cases with water tube boilers. The transformation has been little short of miraculous. Many residents of lake cities remember when the lakes were flashing all over with sail. Now the sailing vessel has almost entirely disappeared, and instead of "white wings" we have long black hulls and trailing clouds of sooty smoke.

The mercantile fleet on the great lakes today rivals anything on either Atlantic coast. Even in comparison with the ocean greyhounds, the modern steel freighter of the lakes is not unimposing. Contrast the dimensions of the John W. Gates of the American Steamship Co.'s fleet with those of three of the biggest Atlantic liners—the St. Louis, the Kaiser Wilhelm der Grosse and the Oceanic.

| | John W. Gates. | St. Louis. | Kaiser Wilhelm. | Oceanic. |
|---|---|---|---|---|
| Length over all..... | 498 | 554 | 648 | 704 |
| Length of keel ..... | 478 | 535 | 625 | 685 |
| Beam ..... | 52 | 62 | 66 | 68 |
| Depth ..... | 30 | 42 | 43 | 49 |

And still they grow. Only the straitened limits of the St. Mary's river, the Detroit river and the channel across the St. Clair flats, confine the expanding models. The canal at Sault Ste. Marie, built in 1855, so deep that it was expected to accommodate the commerce of a century to come, was outgrown and enlarged by 1881, enlarged again in 1886, and now, the last improvement scarce complete, demands still further enlargement. Through the locks at the Sault passes a continuous line of sailing craft, whalebacks, barges, propellers and steamers. "Nowhere on the globe can there be seen a more impressive movement of shipping." The "Soo" passed last year more than six times as many vessels as went through the Suez canal. Nor were they, as one might naturally suppose, a multitude of small craft. The tonnage of the lake carriers going through St. Mary's Falls canal in 1899 was 22,000,000—more than three times that registered

at the isthmus; and this though the St. Mary's canal is open only for a season of 225 days, while the Suez is open throughout the year!

### A FEW FIGURES DEALING WITH ORE AND GRAIN.

What now of the cargoes carried by this mighty fleet? For the past eight years it has comprised 56 per cent. of all the freight moved east of Chicago. Three commodities, iron ore, grain (including flour) and coal, make up the bulk of the material carried. It is extremely difficult to keep up with the racing figures of the grain traffic. No sooner do you grasp the immense proportions of the output than statisticians call upon you to stretch your imagination to take in another cipher. A single lake freighter (the very largest) will carry about 250,000 bushels of wheat, enough to fill 360 cars, or nine trains of forty cars each. Fifty years ago the total amount of grain lifted at the port of Buffalo during the entire shipping season was but one-tenth of the amount elevated there now in a single day!

Amazing, too, is the story of the ore carrying trade on the lakes. The ore mined in the Superior region is 75 per cent. of all the ore consumed throughout the United States; 18,250,000 gross tons of ore were shipped down the lakes last year, an amount equal to one-eighth of the total output for the past forty-four years. At the ore docks at Superior, Duluth or Two Harbors, vessels of 5,000 to 7,000 gross tons capacity are loaded through pockets with chute attachments in a few hours.

Almost all this material comes down the lakes until the impassable Niagara blocks its progress to the seaboard, and it is "bottled up" at Buffalo and other Lake Erie ports. At Buffalo the grain must be lifted from the holds of freighters and transferred to canal barges and freight cars. That is why the water front of Buffalo echoes all day long to the bellow of ponderous freighters, the grunt of stunted propellers and the squeal of officious tugs. That is why the harbor of Buffalo stretches out long skeleton coal trestles to meet the incoming ship. That is why great brown elevators—hulking, high-shouldered monsters—raise their ugly heads along the shores of Buffalo river. Here any day you may see them snuffing the yellow grain through their long steel trunks from the holds of mammoth freighters. Scores of dusty scoopers shovel the grain from the sides of the ship into the path of a charging steam shovel, which drags it to the foot of the "leg," where the bucket chain snatches it, and whisking it 150 feet up into the cupola, flings it off into great bins. One hundred and eighty thousand bushels are whirled aloft, weighed, and spouted out again in yellow streams into the shadowy holds of canal barges within a few hours' time.

### WEST DEMANDS AN OUTLET TO THE SEA.

All this is picturesque and eminently satisfactory to the owners of the elevators. But it is far from pleasing to the man who ships the grain. Why, he reasons, should I pay a man in Buffalo to transship my mammoth cargoes? Why should they not pass in bulk directly to the sea? The west is in dead earnest about a deep water connection with the seaboard, and the westerners are gradually convincing the powers that be that they must bestir themselves if they would not see American commerce diverted to Canadian waters. The report just rendered by the deep waterways commission suggests the construction of a canal around the American side of the falls, beginning at La Salle and ending at Lewiston. To connect Lake Ontario with the Hudson two routes are suggested —one from Oswego lake to Lake Oneida, thence to the Mohawk river, and so to the Hudson at Albany, and the other from the St. Lawrence to Lake St. Francis, to Lake Champlain and the upper Hudson. The undertaking would cost the nation a cool $206,000,000. But, on the other hand, it would enable us to carry our produce to European markets at a cost no greater than that now paid for transportation to the seaboard. The project will be opposed by interested capital; the consummation may be long delayed, but it is coming surely. Our magnificent merchant squadron cannot be much longer penned up in inland waters. Its destiny is the open sea.

## A VERY LARGE COAL PIER.

The large coal pier of the Baltimore & Ohio Railroad Co. at Curtis bay, on which workmen have been engaged since last October, is about completed. The pier is about 350 ft. long, and will cost in the neighborhood of $350,000. It will have the capacity of loading four ocean freighters at the same time and has chutes enough to handle all the coal that the cars can conveniently carry. To gain an idea of the strength of the pier, one has but to gaze at the mammoth pieces of timber, a foot in width. There is not a single strip of lumber used that does not measure at least 2½ in. in width. The larger ocean liners will find no difficulty in docking at the pier as the channel is dredged to 30 ft. The round house at Stone cove is well under way, but there yet remains several weeks' work on the structure, which, when finished, will relieve the congested condition of Locust point. The large area of what three months ago was a great field is being rapidly transformed into a railroad yard, capable of accommodating 2,500 cars at the same time. In order to reach Curtis bay the cars must cross the Patapsco river at Brooklyn. It will take until the first of next year to get things in good working order, when the B. &'O. will have one of the finest terminals in the world.—Baltimore Journal of Commerce.

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The resignation of G. W. Wallace, long mine superintendent for the Minnesota Iron Co., to accept the management of the Corrigan, McKinney & Co. mining interests, has led to a number of changes in the Minnesota Iron Co.'s organization. Edwin Ball, manager of the Minnesota mines at Soudan, becomes general manager of the Fayal, Genoa and Auburn, but will continue to reside at Tower and to be manager at Soudan. G. C. Brown, manager of the Genoa, becomes assistant manager of the Fayal. A. H. Ahbe, of the Minnesota, becomes assistant manager; F. E. Keese, mining captain at the Genoa, becomes assistant manager there.

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A dispatch from Berlin announces the names and dimensions of the two monster steamships which are in course of construction for the North German Lloyd Steamship Co. They are the Kaiser Wilhelm III of 19,500 tons and 39,000 H. P., and the Kron Prinz Wilhelm of 15,000 tons and 33,000 H. P. The vessels, it is understood, will be placed in the New York and Bremen service of the line.

## ITEMS OF GENERAL INTEREST.

The Maryland Steel Co., Sparrow's point, Md., will launch the dredging ship Thomas for the Metropolitan Dredging Co. of New York on Oct. 2.

The William R. Trigg Co., Richmond, Va., has notified the navy department that the torpedo boat destroyer Decatur will be launched at its yard, Richmond, Va., today, the 26th.

The Vulcan Iron Works Co., Toledo, has issued a campaign blotter which has the following as its motto: "Don't let politics interfere with your consideration of the Vulcan steam shovel."

H. Bloomsburg & Co. of Newport News, Va., manufacturers of what are known as equilibrium circulators for heating and circulating water in steam boilers, have fitted fifty of them to boilers this year, including thirty for the big Pacific Mail ships building at Newport News.

P. S. King & Son, Nos. 2 and 4 Great Smith street, Westminster, London, have just issued from their press a book on "High Speed Steam Engines" by W. Norris and Ben H. Morgan. The work should prove a useful guide and reference to designers, users and makers of high speed engines. It is copiously illustrated.

Joy's patent assistant cylinder has been fitted on the engines of vessels in the merchant marine aggregating 400,000 I.H.P., and on warship engines of over 600,000 I.H.P. This steam cylinder, which balances the valve of an engine and takes the weight off the eccentrics, is patented by David Joy, Son & Pryor, No. 85 Gracechurch street, London, E. C. Mr. Joy is of "Joy valve gear" fame.

Catalogue No. 60, issued by the Watson-Stillman Co., No. 204-210 East Forty-third street, New York, contains an assortment of illustrated sheets selected from the illustrations of hydraulic machinery manufactured by them. The firm manufactures a large line of high pressure tools for all purposes, and if a special machine of any sort in this line is required they are always prepared to make it with dispatch. Their facilities are of the highest.

Recently the German imperial mail steamer General of the East African line sailed from Hamburg as an "extra steamer" for Cape Town, Durban and Delagoa bay, touching at Flushing, Lisbon and Las Palmas. This may be regarded as the virtual inauguration of the new German-African mail steamship line, although the subvention contract does not come into force before April 1, 1901. There will in future be two sailings per week, the boats going all round the African coasts, starting down the east and west coasts alternately.

Mr. A. N. M. Gray of 25 Equitable building, Boston, who has an electric log that is said to be extraordinarily true (it was described in a recent issue of the Review) will shortly make arrangements for bringing his device to the notice of lake vessel masters. He has had some correspondence with Mr. W. C. Farrington, vice-president of the Northern Steamship Co., and expects before the close of navigation to have one of the Northern line boats tow one of the logs for inspection. One of them is now being used on the Atlantic by the Dominion line steamer New England and another is being towed by a Gloucester fisherman.

## TO MANUFACTURERS OF BOILERS AND BOILER PLATE.

Regulations issued by the supervising inspector general of steam vessels regarding the data to be furnished the treasury department by manufacturers of boilers and boiler plate are as follows:

"To manufacturers of boilers and boiler plate: Notice is hereby given that the inspection of iron and steel plate under the act of congress approved Jan. 22, 1894, must be confined exclusively to inspection of iron and steel to be used in the construction of new boilers of steam vessels. Manufacturers of boiler plate will hereafter be required to include in their application for inspection of plate at the mills the following information: Name of steamer, if she has one, upon which the boiler is to be used, for which the plate is ordered; if the steamer is not yet named, then the name of builder of hull; for whom built; the waters upon which the steamer is to be navigated; United States local inspection district in which she will be inspected; number and thickness of plates for shell, steam chimneys. lining of same, shell of steam and mud drums; thickness of head and side sheets, domes, crowns of furnaces and back connections.

"To insure prompt inspection of their material, manufacturers of boilers for steam vessels should supply the above information when forwarding their orders on a form substantially as follows:

"Order for steel for marine boilers.

"Only such plates as require government inspection to be shown on this sheet.

"Plates for repairs or stock boilers will not be inspected at the mills. Material for such repairs will be inspected by the inspector in districts where the material is to be used.

"All the information called for in table below is positively necessary to the assistant inspector so that he may determine intelligently the exact plates subject to tensile strain in the completed boiler.

..... .....19..

"For..... .....of..... .....

| No. of plates. | Material. | Diameter heads. | Length. | Width. | Thickness. | Location of plates. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

"Name of boiler manufacturer,....., at..... Kind of boiler..... Shop No..... Diameter of boiler. Length of boiler. Steam pressure required. Are heads to be bumped or flat. Name of builder of boat,..... Name or number of steamer for which boiler is built,..... For whom built, ....., of ..... Waters upon which steamer is to be navigated..... Tensile strength. Local inspection district in which completed boiler will be inspected.

"The attention of manufacturers of boilers and boiler plate is particularly directed to the requirements in above form, as assistant inspectors at the mills will be justified in refusing to make tests of orders upon failure to give the information called for."

## TWO LARGE TRAMP FREIGHTERS.

ORDERS HAVE BEEN GIVEN TO THE MARYLAND STEEL CO. FOR THE NUCLEUS OF A FLEET OF OCEAN STEAMERS.

The order placed by Kidder, Peabody & Co. of Boston with the Maryland Steel Co., Sparrow's point, Md., for two freight steamers of between 11,000 and 12,000 tons capacity is of the utmost significance. These ships are but the nucleus of a fleet of similar vessels. For several years this firm, in connection with persons interested in the Boston & Philadelphia Steamship Co. and the Boston Towboat Co., have desired to enter the freight carrying business on a large scale and have watched the cost of building American ships as compared to their earning capacity. Even now they realize that the ships would cost less if built abroad, but they are encouraged to pay the difference for the sake of sailing under the American flag and conducting their business from Boston as a home port, where it will be under their personal supervision. The vessels are distinctly of the tramp class and are to sail to ports all over the world, obtaining a cargo wherever it may be carried at a profit. It is the purpose of the Boston company to become a factor in the business of carrying big freights between large ports, as the draught of their ships would keep them out of small ports. The ordinary tramp steamer is only half this size. These ships therefore will show an economy in fuel and wages for the cargo carried. The vessels will draw 27 feet of water and will be fairly speedy. Mr. Alfred Winsor, who is now president of the Boston & Philadelphia Steamship Co. and the Boston Towboat Co., has been selected as the president of the new company, which, however, will be entirely independent. Over $1,500,000 is involved in the enterprise.

The steamships are to be of the following dimensions: Length over all, 505 ft.; between perpendiculars, 488 ft.; beam molded, 58 ft.; depth to the upper deck, 40 ft.; with straight stem and elliptical stern and three complete steel decks. They are to be schooner rigged, with two masts and one smokestack; six water tight bulkheads and two partial bulkheads, with a double bottom extending the entire length of the ship. In No. 3 hold will be a deep ballast tank fitted for water ballast, having a capacity of 1,000 tons, making a total water ballast capacity of about 2,500 tons. On deck will be fitted nine cargo hatches and ten side derrick posts. On these derrick posts and the masts will be a full equipment of cargo derricks for the rapid handling of the immense cargoes which these ships will carry. There will be placed about the decks twelve double-cylinder steam winches, to be used in connection with the cargo derricks. Forward will be fitted a steam windlass and a full equipment of stockless anchors, each weighing 10,600 lbs. A steel deck house will be fitted amidships for the accommodation of the deck officers. Above this will be a chart room and pilot house, and above these a navigating bridge, containing a full equipment of telegraphs, both to the engine room and the steam steering gear room aft. Alongside of the engine room casing will be fitted the quarters of the engineer officers. A galley, equipped in the most modern manner, will be fitted aft of the engine room casing. The quarters for the sailors and firemen will be fitted in a deck house aft. A direct connected steam steering gear will also be fitted in this house, but arranged to be controlled from the navigating bridge. On each side of this deck house there will be fitted a powerful steam warping capstan.

The propelling power will consist of a twin-screw, triple expansion, surface condension engine, cylinders as follows: High pressure, 23½ in.; intermediate pressure, 39¼ in.; low pressure, 63 in. in diameter, and a stroke of 45 in. These engines are to develop about 5,000 H. P. when running at ninety revolutions per minute. The propeller will be 15 ft. in diameter, and when running at the above speed will drive the ship at the rate of 14 knots per hour. A complete equipment of pumps for the feeding of the boilers and the pumping out of the ballast tanks and bilges will be installed; also a Worthington feed heater for the purpose of heating the feed water. A large evaporator, capable of making forty tons of fresh water every day, will also be furnished. The ships will be lighted throughout by electricity, the plant being installed in the engine room, capable of furnishing 300 lights. There will be four single-ended Scotch flue boilers, 15 ft. in diameter and 12 ft. long, built to the requirements of the United States inspection laws, for a working pressure of 200 lbs. to the sq. in. Each boiler will have three corrugated furnaces, 42 in. in diameter, and a total grate surface of 280 sq. ft., the total heating surface being 11,000 sq. ft. Howden's forced draft will be installed in a most complete manner. The coal bunker capacity in these ships will be 850 tons, and 400 tons in the reserve bunker. The vessels will be manned by a captain and three deck officers, a chief engineer and three assistant engineers and thirty-five men, making a total of forty-three men.

## WINTER NAVIGATION ON LAKE MICHIGAN.

A dispatch from Ludington, Mich., says that if the present plans of the Pere Marquette Railway officials are carried out, the company will have during the coming winter the greatest fleet of winter steamers that ever navigated Lake Michigan. It is given out that the Hart line steamer Petoskey, which is now under season charter to the Pere Marquette company, and covering the Holland-Milwaukee route with the F. & P. M. No. 4, will be retained permanently by the company, and perhaps purchased outright. Both these boats are to be pulled off the Holland run very soon, and will handle the rapidly growing freight and passenger business between Ludington and Milwaukee. The car ferry Muskegon, which is running from Muskegon to Milwaukee during the fruit season, is badly needed to help out the car ferry Pere Marquette, which is making two trips daily between Ludington and Manitowoc and still is unable to handle the business. The fleet, then, that will trade out of Ludington during the coming winter will consist of F. & P. M. steamers Nos. 2, 3, 4 and 5, the Petoskey and the car ferries Pere Marquette and Muskegon. The No. 5 is now under charter to Thomas Fitzpatrick and Capt. Doyle, but she will be at Ludington at the close of navigation. Ever since the big car ferry Pere Marquette came to Ludington the Pere Marquette people have experienced comparatively little difficulty in maintaining continuous winter navigation. The leviathan enters the channel twice each day and leaves a passage through the ice which will readily admit one of the smaller steamers. With two car ferries next winter Ludington harbor will remain wide open.

## BENNETT AND DREXEL YACHTS.

The steam yacht Lysistrata, recently sent off the stocks by William Denny & Bros. of Dumbarton, Scotland, to the order of Mr. J. Gordon Bennett of the New York Herald, is one of the largest steam pleasure yachts in the world. As a strictly private pleasure vessel she is probably rivalled, as regards dimensions and tonnage, by the floating palaces of some other American millionaires—the Valiant, for example, built for W. K. Vanderbilt by Laird & Co. of Birkenhead, exceeding her in tonnage by 100 tons. In length of keel, however, and the quality of great speed to which that length contributes indirectly, the Lysistrata is intended to equal, and perhaps surpass, anything ever built. She is from the designs and has been built under the close personal inspection of Mr. G. L. Watson of Glasgow, whose name, perhaps, more than any other, is unbrokenly associated with success in the production of vessels of this high class. The new vessel is to replace the owner's present yacht Namouna, and has a length over all of 314 ft. 6 in., and on water line of 285 ft., a breadth extreme of 40 ft., and a tonnage—Thames measurement—of 2,082. She has a straight stem, and a long stern with a full poop, a long shade deck amidships, and a short turtle back forward. Unlike other large yachts, she is provided with only one mast, which is placed aft of the funnel, and has a short yard for signalling purposes only. Besides the shade deck, on which there are large deck houses, there are the main and the cabin decks, on which the private rooms, dining saloons and bath rooms are skilfully grouped and most lavishly furnished, several of the state rooms being 20 ft. square. The officers and crew have fine accommodation on the cabin deck aft, and rooms and every convenience are provided for stewards and private servants at the forward part of the cabin deck. The machinery of the Lysistrata consists of two sets of four-crank triple expansion engines and four single-ended cylindrical multi-tubular boilers; the whole by Denny Bros. and calculated by them to give her a very high rate of speed. A member of the firm, in speaking of this at the launch, stated that her owner would thereby be able to utilize her in any capacity, either peaceably or in war.

There is undergoing completion at the present time at Greenock another palatial steam yacht from Mr. Watson's designs, the owner in her case also being a wealthy American, Mr. A. J. Drexel of Philadelphia. An outstanding point of difference between Mr. Bennett's vessel and this vessel—the Margarita—is that the latter has a very long and graceful cut-water stem and a long overhanging stern; so that while the overall length is 323 ft., as compared with the Lysistrata's 314½ ft., the length on load line is only 272 ft., as against 285 ft., and the tonnage under 2,000, as against 2,082 tons. Her breadth is only 36½ ft., as against 40 ft. It goes without saying that sumptuousness and luxury also characterize the living accommodation on board the Margarita, which was built by Scott & Co., Greenock. The arrangements as to decks and apartments are not unlike what has been described as pertaining to the Dumbarton-built vessel, Mr. Watson, of course, having been responsible for these features in both vessels. The drawing room extends the whole width of the yacht, and is finished in Louis XV. style; the dining room is in Chippendale, a fine, airy apartment high up in the vessel, and lighted by a dome skylight; the library is in Empire style, in which Spanish mahogany artistically carved has been freely used; and the smoking room is in old English style, with oak panelling. Her machinery is of the twin-screw triple-expansion four-crank type with Thom's arrangement of valves and gear. There are two double-ended cylindrical multitubular boilers to work under high pressure. The designed indicated horse-power of the engines is 5,000, and the speed on trial 17 knots. Elaborate auxiliary pumping and other machinery is plentifully present in the machinery department, which also includes refrigerating and electric lighting plants, the former being designed for 1,200 lbs. of ice per day, and the latter for 800 lights. The mechanical ventilating and heating systems are on a most perfect scale. The Margarita will have a crew of sixty-eight all told, and her first long cruise will be to Japan.

## GERMANY'S SUBSIDIZED AFRICAN STEAMSHIP LINES.

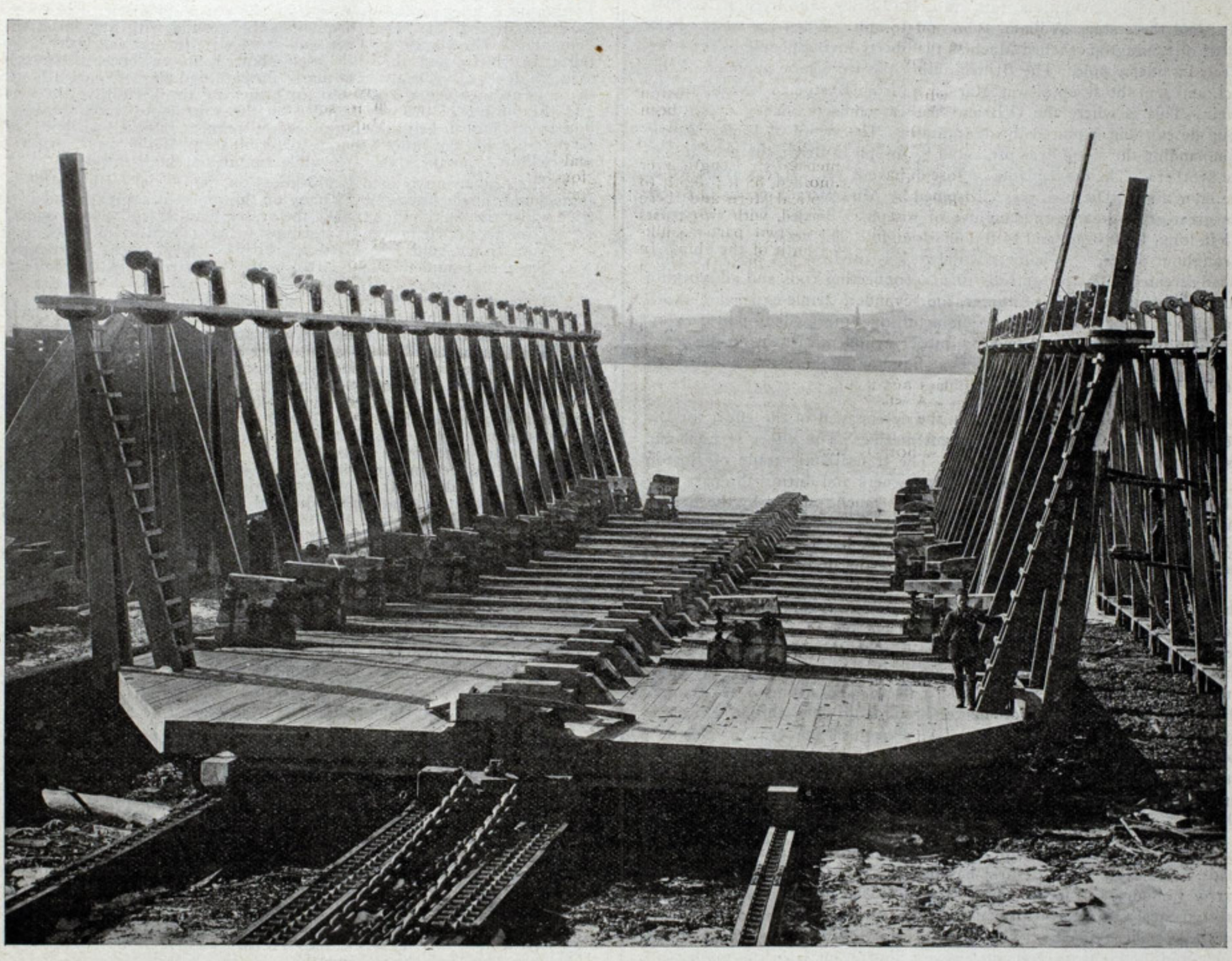
Efforts are now being made in Germany to secure the extension of the imperial mail subsidy to lines running to South Africa. In May, 1890, the German government entered into a contract with the East African Steamship Co. for the payment of subsidy to a line of steamers running direct from Hamburg to the chief harbors of the German protectorate on the East African coast. In addition to this main line, coast service was established within the limits of the protectorate and the Portuguese possessions, and later a regular service was established between Bombay and Zanzibar. On the main line there are sailings from Hamburg every fourteen days, the coast line steamers sail monthly, and the Zanzibar-Bombay service is every two weeks. On the main line a minimum speed of 10½ knots is required; for the coast service no rate of speed is specified. The imperial subsidy for these lines amounts now to about $225,000 per annum. The effect of this subsidy is shown in the increase of the freight traffic on these lines from 21,651 tons, valued at $3,050,000, in 1891, to 78,517 tons, valued at $9,784,750, in 1898. The measure of benefit to German commercial interests is found in the increase in the value of German goods carried from about $1,500,000 in 1891 to about $4,778,000 in 1898. Furthermore, the maintenance of this service has caused the building of no less than nine new steamers in Germany, of 25,603 tons registry and costing about $2,750,000.

The expiration of the contract of 1890, under the terms of which this service was established, is being made the occasion for an effort to secure not only a continuance of the original subsidy but also an extension of the service to South Africa and the increase of the speed requirements in order to equal the time made by the steamers of the French "Messageries Maritimes." The pending bill for the renewal of the contract of 1890 calls for the payment of subsidy up to a maximum of $337,500 per annum for a period of fifteen years; service is to be maintained direct between Hamburg and Cape Town via the west coast, and also between the same points via east coast and Suez canal, with local service between all important points on that coast. To perform the contemplated service there will be required two large steamers now ready, five large steamers still to be built at a cost of $625,000 each, and four intermediate vessels of medium size, to cost about $325,000 each. It is by such a progressive policy as this that German trade is being pushed into every corner of the globe.

### LARGE MARINE RAILWAY.

That the day is past when a marine railway could be truly considered a makeshift substitute for a dry dock, and that the up-to-date marine railway has taken its proper place as a thoroughly appointed and safe form of dry dock, is demonstrated by the new modern marine railway recently designed and built by H. I. Crandall & Son, engineers, East Boston, Mass., for the Townsend & Downey Ship Building & Repair Co., at Shooters island, New York. The cradle is 320 ft. long on keel blocks and 80 ft. wide, and is capable of hauling, with an auxiliary trailer, a ship 400 ft. long and of 4,000 tons.

The tracks and cradle are constructed of Georgia long-leaf pine. The tracks consist of four "ways," comprising (1) two "center" ways placed 5 ft. 6 in. apart, heavily railed, to carry the main load, and (2) two "side" ways placed 45 ft. apart, which carry the cradle and bilge loads. The cradle has 13 ft. of water over keel blocks forward, and 17 ft. aft at mean low tide; at ordinary high water, 17 ft. forward and 21 ft. aft. The keel blocks are spaced 4 ft. apart and give 4 to 5 ft. of height under the flat bottom of a ship, which, with the sides of the cradle being open to light and air, makes this cradle an ideal place to work on a ship's bottom.



A MODERN MARINE RAILWAY—BUILT BY H. I. CRANDALL & SON, EAST BOSTON.

The floor of the cradle is 80 ft. by 320 ft. and is practically on a level with the pier alongside, from which timber, plates, shapes, etc., are handled most conveniently. The cradle is also equipped with thirty-six releasing bilge blocks, these being one of Messrs. Crandall's recent improvements.

The cradle is hauled up by a series of four chains arranged with equalizing gear, which divides the strain exactly equal between the four chains, thus preventing any one chain from getting more than its due share of the load. These chains are made of 2½-in. iron, with a special type of link, and are driven by four steel chain wheels, these in turn being driven by a train of heavy gearing. The power is furnished by a pair of coupled horizontal engines, 20-in. diameter by 24-in. stroke. Steam is furnished by two horizontal tubular boilers, 5 ft. 6 in. by 16 ft. The time required for hauling ordinary-sized ships is 20 minutes and 30 minutes for loads up to the capacity of the railway.

The tracks over which the cradle runs rest on a foundation of spruce piling, driven through about 25 ft. of stiff red clay and sand to hard bottom, each pile being driven to the refusal of a 3,000-lb. hammer falling 18 ft. The machinery rests on foundations of concrete, over nests of piling.

This marine railway is situated in a fine still-water basin, 600 ft. wide by 1,000 ft. long, with long piers on either side, which, taken together with the rest of the Townsend & Downey Co.'s works, makes it one of the best appointed ship repair yards in the port of New York.

### NEW STEEL WORKS AT SYDNEY.

The following brief but interesting description of a short visit to Sydney, Cape Breton island, where a large steel works has been under construction for some time past, is given by a correspondent of the Montreal Gazette:

"A day was spent in seeing the wonderful new steel and coke works which are being erected by the Sydney Steel Co. at this point. North Sydney, where the Newfoundland boat stops, is a town of between 1,500 and 2,000 inhabitants. Across the bay is Sydney proper, and here the establishment of the new works is sending that town forward with rapid strides, until it is not difficult to expect to see it, in the very near future, the largest and most important city of Nova Scotia. At the moment the leading hotel of Sydney is so crowded, that for weeks before we were there, anywhere from ten to thirty or forty cots had to be placed in the drawing rooms at night to accommodate the rush of visitors. It will be within the memory of your readers how the Sydney works were first started by the gentlemen interested in the Dominion Coal Co. The result is that the town of Sydney gave to the new steel company about 500 acres of land and exemption from taxation for thirty years. This land is now being covered with machinery and arranged for the reception of coal and ore. The works themselves are of the most modern character. The wages being paid out in their erection is something like $30,000 a week, and it is expected, when the works are completed, that at least 1,000,000 tons of ore will be reduced each year. To-day there is evidence of experience and skill in the laying out of the property. There are hotels or boarding houses for the workmen, and separate ones for the mechanics. The workmen are boarded and lodged comfortably at $3 a week, and at the higher class boarding houses, I understand, about $5 a week; and both seem, if one can judge from appearances, of exceedingly good value to their patrons. But in addition to the tremendous work going on in the enclosure of the company, there is in the city itself evidence of wonderful progress. Thoroughly built stone roads, well macadamized and drained, are being pushed forward in different directions. Along Whitney avenue we must have passed forty or fifty houses in course of erection, all neat in appearance and of considerable architectural beauty. As another evidence of the great progress of Sydney, we were pointed out the site, recently purchased by one of the banks for $10,000, which, six months ago, it is said, had been bought for $1,000. It looks a little like the old Winnipeg boom over again, and like the Winnipeg boom it is evident that there is justification in the increased values of property."

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The five-masted schooner now being built by H. M. Bean of Camden, Me., for Capt. McLean has been named Van-Allens-Boughton.

# MARINE REVIEW

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The launch of the torpedo boat O'Brien at Lewis Nixon's Crescent Ship Yard, Elizabethport, N. J., on Monday of this week, recalls history. The boat is named O'Brien to perpetuate the memory of the O'Briens of revolutionary fame, and if she is commanded by a crew as gallant as her name she will be a dauntless craft. Morris O'Brien, who lived at Machias, Me., had three sons, William, John and Joseph. When the news of the battle of Lexington reached Machias the liberty-loving people of the town erected a liberty pole. The British authorities were soon apprised of this fact, and sent the sloop-of-war Margaretta from Boston to investigate the affair. This is where the O'Brien brothers come in. They executed a coup de etat and captured the Margaretta. The sword of Lieut. Moore, commanding the sloop, was presented to Joseph O'Brien, the youngest of the brothers. The descendants of Joseph have it yet. It was exhibited at the launching. The boat was christened by Miss Mira Lincoln O'Brien, the great-great-great-granddaughter of Joseph O'Brien. The O'Brien is 175 ft. long, 17 ft. beam and 14 ft. 6 in. draught. The vessel is constructed throughout of steel. Whatever woodwork is used on her has been electrically treated. The piston rods, shafts, connecting rods and all working parts are of nickel steel. Engines four-cylinder, triple-expansion, with one high power cylinder 18 in. in diameter, one intermediate power cylinder 27 in. in diameter, and two low power cylinders 27½ in. in diameter, each with an 18-in. stroke. The boat lies low in the water and will be difficult to locate with the searchlight.

At present Boston is the foremost city engaged in the effort for the redemption of the American merchant marine. The effort is none the less patriotic because it is personal. The transatlantic trade of Boston is controlled absolutely by foreign ship owners and during the past year it has suffered much by the withdrawal of so much tonnage by the British lines for governmental purposes. All the crack liners were removed and their places taken by slower boats. The result has been that the export trade of Boston has suffered seriously during the present year. The firm of Kidder, Peabody & Co. is the first to take advantage of this condition. They are engaged in a courageous and meritorious effort to rehabilitate the American merchant marine. They have placed an order for two steamships, aggregating $1,500,000 jointly, with the Maryland Steel Co. They make this venture without the aid of the shipping bill; if the shipping bill should pass they will build a fleet. The steamers are tramps. They will carry American commerce abroad, and when abroad will carry freight for anyone who pays them. At present 93 per cent. of Boston's commerce goes abroad in foreign bottoms, so that the new freighters ought not to lack employment. With the fall in the price of steel and with high freights prevailing, owing to shortage of tonnage, there is no reason why ships should not make a good return upon the investment.

An unusually large amount of new equipment is being ordered by railroads. The New York Central has placed an order with the American Car & Foundry Co. for 500 box cars of 60,000 pounds capacity. The Pressed Steel Car Co., of Pittsburg, has received a contract for 1,000 cars for the Northern Pacific. The Kansas City Southern has ordered ten compound locomotives, and the Oregon Short Line is in the market for locomotives. Estimates on the construction of new steel cars have been asked by the Lake Shore & Michigan Southern Co. The Chicago Great Western has ordered ten Baldwin compound locomotives. The Buffalo, Rochester & Pittsburg has furnished specifications to the Carnegie Steel Co. for 2,500 tons of steel rails, for delivery next year at prevaling prices.

While reducing the land force in China, President McKinley has decided to increase the naval force in Chinese waters, so that American interests may be amply protected. The following orders have therefore been issued: The Dorothea, at League island, and the Annapolis, at Norfolk, have been ordered to fit out for the Asiatic station. The Wilmington has been ordered to the Asiatic station via the Mediterranean and will be replaced on the South Atlantic station by the Atlanta. The Albany, at Piraeus, has been ordered to Manila. The Kentucky and Vicksburg have been ordered to the New York yard to fit out for the Asiatic station.

Coincidently with the discussion of the subject in the English service papers, the bureau of construction and repair, Washington, has under advisement a re-opening of the question of metal vs. wood for interior fittings of war ships. Considerable data have been collected on this interesting question, and it is not improbable that some modifications in existing practice may be recommended.

## REPORT ON THE ALABAMA.

THE VESSEL IS FOUND SATISFACTORY, BUT NAVAL CONSTRUCTOR CAPPS MAKES RECOMMENDATIONS REGARDING IMPROVEMENTS IN FUTURE SHIPS THAT MEET WITH APPROVAL OF THE DEPARTMENT.

The board of inspection and survey has submitted its report to the secretary of the navy upon the official trial trip of the Alabama. As formerly announced, the vessel's mean speed is 17.013 knots per hour. The average revolutions of the starboard engine were 113.27 and of the port engine 114.72. The maximum steam pressure at the boilers was 180 lbs. and the average 176.6. The displacement at the trial draught of 23 ft. 6 in. was 11,570 tons, the weight of the machinery being 1,131.17 tons. Naval Constructor W. L. Capps, in a report to Rear Admiral Rodgers, makes the following recommendations:

"As a whole the bottom was in excellent condition, both as regards fouling and corrosion—this condition being unquestionably due to her having been in fresh water almost continually since her last docking, which had taken place more than twenty-six months previously. The bottom itself, after careful examination, showed no evidence of bad workmanship, or that the vessel had taken the ground with any force since launching. The plating was fair, and there were no signs of leaky seams, butts, or rivets, and the ship itself showed no evidence of straining through docking. The draught marks forward and aft were carefully verified and arrangements completed for observing the heeling of the vessel and the outline of the wave profile on the ship's side, vertical rows of figures one foot in height being placed at frequent intervals on both sides of the ship for the more accurate determination of the wave profile by observation from the ship itself while running at high speed. * * *

"The Alabama averaged 17.013 knots on the official trial course; and immediately after passing No. 1 buoy on the return passage, the helm was tried under the maximum speed of the vessel, with the following results:

"Time to put helm from amidships to hard astarboard, 12 seconds.

"Time to put helm from hard astarboard to hard aport, 20 seconds.

"Time of completing full circle with starboard helm, 4 minutes, 2 seconds.

"Time of completing full circle with port helm, 4 minutes, 40 seconds.

"List to port when turning with port helm, 3¼ degrees.

"List to starboard when turning with starboard helm, 3¼ degrees.

"The ammunition hoists, except those of the 13-in. guns, were tested, and, with the exception of a slight defect in the after 6-pounder hoist, were found quite satisfactory. Winches, anchor engines, steering gear, ship's blowers, boat cranes, and electric hatch rising gear were all examined and worked satisfactorily. The electric turning gear for the 13-in. turrets was not complete and could not be tested. It should be subjected to tests before acceptance of the vessel.

"Actual inspection of the vessel in New York and during her trial trip off Cape Ann, and reports of officers quartered on the vessel on her recent trial trip, make it evident that additional ventilation is necessary for the amidship berth deck spaces and the after end of the upper deck. The actual quantity of air supplied by the blowers of the Alabama is much less than that available on the Kearsarge and Kentucky, vessels of the same general dimensions, recently inspected by the board. This difference is due, in great part, to the lower speed of the steam-driven blowers of the Alabama, and the necessarily tortuous lead of the supply pipes. But, without changing in any marked degree the present arrangement of blowers and air ducts, it is believed that a very great improvement in the ventilation can be provided without interfering in any way with the efficiency of the ship, or resorting to radical changes. The proposed changes are as follows:

IMPROVEMENT IN VENTILATION.

"1. To provide a direct supply of fresh air to the petty officers' quarters on the berth deck by means of a ventilator carried from the after part of the petty officers' quarters, to such a height that the cowl will be above the upper bridge awning. An inspection of the ship and a careful location of the obstructions on each deck, indicate that a ventilator at least 16 in. in diameter can be installed for this space; and, as it is forward of the smoke stack, and high enough to get a free supply of fresh air, it can always be used as a direct supply.

"2. For the group of three warrant officers' rooms located amidships (an arrangement made after the original design of the vessel was prepared, and in order to accommodate the additional warrant machinists authorized by the act of March 3, 1899), a direct ventilator can be provided, the upper portion being divided and carried above the level of the vegetable lockers on the bridge deck. When steaming it may be found advantageous to use this ventilator as an exhaust, but when at anchor it would probably be preferable to use it as a supply.

"3. To provide permanent trunks between the coal chute openings on main and upper decks, between frames 55 and 56, the opening on the upper deck being provided with a short portable mushroom ventilator. These chutes are at present provided with portable trunks between the main and upper decks, but the fitting of permanent trunks does not interfere in any material degree with the clear space on the decks, and, as they are 30 in. in diameter, with a direct opening to the air space above the upper deck, the outlet for hot air from the berth deck will be very great and will materially lower the temperature in that compartment.

"4. It is also recommended that short portable ventilating trunks be provided for the loading scuttle openings on main and upper decks, between frames 45 and 46 and 40 and 41, to provide additional escapes for the hot air in the berth deck compartment immediately over the boilers.

"5. As an additional means of reducing the temperature in this overheated space it is recommended that the under side of the protective deck immediately above the boilers be coated with a non-conductor, such as silicate of magnesia or asbestos board, and the supply ducts for the amidship quarters of warrant and petty officers be made more direct and of greater capacity than those at present installed.

"6. The after part of the upper deck, under the after bridge, is unusually overheated, the hot air from the engine room being discharged into a pocket under the lower bridge without sufficient means of escape. This can be remedied by cutting a hatch in the bridge deck immediately over the engine hatch and in size about 5 ft. by 3 ft. 6 in., and covered by a flush grating so as not to interfere with traffic, proper compensation be-

ing made for the strength of plating so removed. In addition to the grating, two openings should be cut on each side of the middle line in the upper part of the hammock nettings forming the after enclosure of the upper deck.

"This whole subject of ventilation was gone over with the acting superintending constructor, Assistant Naval Constructor R. H. Robinson, U. S. navy, and there appeared to be no difficulties in the way of making the above changes expeditiously and without much expense; they are therefore strongly recommended. The insulations of the protective deck by means of a non-conducting material I consider the least important of the means recommended above, and, if undue delay would result thereby, would recommend that this change be deferred until a more convenient time, as there will be little more difficulty in making this change six months hence than at the present time.

PROPOSED IMPROVEMENTS IN FUTURE SHIPS.

"I desire to call special attention to the following features of the Alabama's design which I believe should, and could, be improved upon in future designs:

"1. The double bottom forward and aft should be carried to the extremities of the ship. This is especially necessary forward, as accidents to the outer bottom, through grounding, etc., are very liable to occur in the forward compartment which now has but a single bottom.

"2. The wing compartments of the Alabama are very large, and when open to the sea, would give the vessel an appreciable list without means of rectifying the same. Communication between corresponding wing compartments on the opposite sides of the ship should be established either by cross pipes near the inner bottom, or by direct connection with the adjacent inner bottom compartment, preferably the former, in which case there should be a T connection, with valves, between the connecting pipe and the inner bottom. These wing compartments could then be flooded or emptied at will, and the trim of the ship adjusted when one side has been damaged and the vessel listed in consequence.

"3. The ventilation of the Alabama, as compared with that of the Kearsarge and Kentucky, is noticeably inferior, and it is believed that the superiority of the ventilation of the Kearsarge class is largely due to the use of electrically-driven fans of high velocity. There can be no possible question as to the results obtained in the two vessels, and as the vessel ventilated by electrically-driven fans proved itself so much more satisfactory, it is strongly recommended that electrically-driven fans be substituted for steam-driven fans in all future construction, the development of electric motors at the present time being such as to entirely eliminate the experimental element from such mechanism, which might have been urged against them with propriety, a few years ago.

"4. Attention is also invited to the inadvisability of fitting all battleships as flagships. The essential requirements of a battleship are opposed to a convenient arrangement of extensive quarters below the main deck; and by giving so much space to the captain and admiral the wardroom accommodations are pushed forward, and the junior officers and warrant officers are assigned spaces that are very difficult to render habitable when not encumbered with numerous bulkheads, and when so subdivided are almost intolerable. It is therefore recommended that special consideration be given to this subject in future designs, with the view of reducing the number of battleship flagships to a minimum.

"5. In the case of the Alabama, the quarters of the warrant officers and junior officers could be greatly improved by assigning three of the junior officers to two of the staterooms now assigned to ward room officers, and assigning the ward room officers who are to occupy the three staterooms, at present located amidships, to the staterooms vacated by the junior officers. This would necessitate assigning two warrant officers to one room in the case of the junior warrant officers; but this can hardly be considered a hardship for men who are junior in rank and years, and whose seniors among the junior commissioned officers have only recently been provided with rooms of any description. It may be also noted that on the Alabama the flagship arrangement would not be interfered with by pre-empting two of the present wardroom staterooms for junior officers, since the original complement allowed three commissioned engineer officers in the wardroom, and the present regulations only contemplate one—the warrant machinists practically taking the place of the omitted engineer officers—so that it is entirely practicable to remove the midship enclosure for the three warrant officers and to assign them as before noted, thus providing more comfortable rooms for those officers without seriously interfering with the general arrangement of the vessel; and such a disposition is recommended in the event of the proposed ventilation not reducing the temperature sufficiently low for comfortable habitability.

"6. The berth deck space immediately over the boilers of a battleship must of necessity always remain overheated under normal conditions. But this overheating can be increased to an intolerable degree by so dividing the space so as to provide numerous pockets for hot air. This subdivision, and consequent overheating, could be greatly mitigated if the very great space now assigned to the commander-in-chief, his personal staff and clerical offices, were available for the accommodation of the ship's officers, thus removing almost entirely from the heated berth deck all bulkheads and partitions necessitated by the present arrangement of officers' staterooms.

BEHAVIOR OF THE VESSEL ON TRIAL.

"On the final full speed trial, and during the helm evolutions immediately following it, special note was made of the behavior of the vessel with reference to steadiness, vibrations and maneuvering qualities. The state of the sea was such as to give no indication whatever of her seagoing qualities, but of these there can be little doubt, as vessels of similar form and generally similar arrangement of weights have been most satisfactory. The vibrations were comparatively slight when running at maximum speed—the points of apparent maximum vibration being immediately over the propellers and the main cylinders and the forward end of the forward boiler room. The maneuvering qualities were excellent, and the vessel answered her helm promptly and effectively—the tactical diameter being unusually small, and, as estimated by the eye, not more than two and a half times the length of the vessel. As seen by the wave profile, the bow wave was comparatively high, but the general disturbance of the water throughout the remaining length of the ship was unusually small.

"In conclusion, I have to state that a careful examination of the vessel showed, so far as can be determined at the present time, that—

"1. The vessel is sufficiently strong to carry her armor, armament, equipment, coal, stores and machinery indicated in the drawings, plans and specifications.

"2. That the vessel, including hull, fittings and equipment, and the fitting, fixing, placing and securing all armor and other hull work required under the contract, is strong, well built and well performed and in strict conformity with the contract, drawings, plans and specifications, and with duly authorized changes in the same."

The navy department has approved the recommendations made by the naval constructor.

## PHILADELPHIA AS A SEA PORT.

Philadelphia is rapidly coming to the front in regard to its maritime trade, and it is now reported that the Baltimore & Ohio Railroad Co., whose new pier at Jackson street wharf is completed, has closed contracts with the North German Lloyd Steamship Co. and with an English steamship line for regular service between Philadelphia and Bremen and between Philadelphia and London, respectively. The former company is the largest steamship line in the world, and maintains direct service from New York to Bremen and other ports. For the time being, chartered vessels will be used for the London service, which will be followed by other vessels, probably those of the Leyland line, which now trade to New York. The latter company is also a large owner of English tonnage and can furnish the requisite vessels on a short notice.

The bringing to Philadelphia by the Baltimore & Ohio Railroad Co. of these two new lines of transatlantic steamers and the addition to its fleet of vessels of the International Navigation Co. in the near future, together with other already established lines of steamers will place Philadelphia in the front rank among the other large shipping centers of the world. With the two new services, Philadelphia will have no less than fifteen regular foreign steamship companies carrying passengers or freight, and when the deep waterway to the Delaware bay is completed, this number may be further increased. At the present time the companies operating from Philadelphia, with the vessels run by each, are as follows:

FOREIGN LINES.

To Liverpool, the American line has a weekly service, the company operating five boats. It is on this line that the International Navigation Co. will in the near future improve the service by the addition of the splendid steamers Noordland and Westernland, now running from New York.

To Antwerp, the Red Star line operates three boats, sailing every two weeks. All the steamers of these two lines make a specialty of carrying passengers, offering as handsome accommodations as any of the lines sailing from New York.

To Rotterdam and Amsterdam, the Cosmopolitan line gives a weekly service, operating six steamers.

To London, the Atlantic Transport line operates from weekly to fortnightly sailings, and runs from three to six vessels.

To London, the Philadelphia Transatlantic line gives a weekly service by running seven boats.

To Glasgow, the Allan line gives a fortnightly service, running three to four vessels.

To Hamburg, the Hamburg-American line gives a fortnightly service, running four or five boats.

To Avonmouth and Bristol, the Philadelphia Transatlantic line gives a semi-monthly service, running two steamers.

To Leith, the Cosmopolitan line has started a service with one vessel, which will shortly be increased.

To Havana and Santiago, the Earn Line Steamship Co. gives a fortnightly service, running two to three steamers, besides a half dozen other boats to various West India ports.

To Mexico and West India ports, the Munson line send at least six steamers a month.

To Rotterdam and Amsterdam the Prince-Keystone line gives an irregular service at the present time, but it will shortly be arranged that at least three steamers a month will sail.

COASTWISE LINES.

To Savannah, the Merchants and Miners Transportation Co. will run a steamer every five days, beginning Oct. 1, carrying both freight and passengers.

To Boston, the Winsor line runs a tri-weekly service, carrying both freight and passengers.

To Providence and Fall River, the Winsor line runs a semi-weekly service; freight only.

To Bridgeport and New Haven, the Ericsson line runs a weekly service; freight only.

To Baltimore the Ericsson line runs a daily service, carrying both passengers and freight.

To New York, the Clyde line runs a daily service; freight only.

To Richmond and Norfolk, the Clyde line runs a tri-weekly service; freight only.

To Albany and Troy, the Clyde line runs a weekly service; freight only.

## TWO NORTH GERMAN LLOYD MONSTERS.

The Vulcan Works at Stettin is constructing two giant steamships for the North German Lloyd Co. They are to be called Kaiser Wilhelm II and the Kron Prinz Wilhelm. Speed is the especial consideration in the latter vessel. Gustav H. Schwab, manager of the North German Lloyd Steamship Co. in New York, speaking of the Kron Prinz Wilhelm, says: "She will be ready in five or six months, but will not make her maiden trip until next autumn. She will be of 15,000 tons burden and 33,000 H.P. I expect to see her eclipse the feats accomplished by the Kaiser Wilhelm der Grosse. The Kaiser Wilhelm II, named in honor of the present emperor, will be larger than the Oceanic by 2 ft. and the Deutschland by 20 ft. She will be 706 ft. long and 70 ft. beam."

The Nickel Plate road announces to the public that Euclid avenue station, Cleveland, is now open for all trains. Passengers may now secure tickets and have baggage checked for all trains east or west bound at this station. 204, Oct. 7.

### GASOLINE ENGINES IN SAILING VESSELS.

The use of American made gas and gasoline engines as auxiliaries in sailing vessels has passed the experimental stage, and a San Francisco firm now has the honor of having equipped an entire fleet of foreign owned vessels engaged in the South Sea island trade. The selection of American engines was not made through choice, but only after repeated experiments had proved that German and other European machines were imperfect and incapable of supplying the power required. President Poindexter of the Hercules Gas Engine Co. of San Francisco gives the following details of the transaction:

"Some years ago, I believe it was in 1896 or 1897, we received an inquiry from the firm of Hernsheim & Co. of Hamburg as to whether we could build a gas or gasoline engine of sufficient power to propel one of their vessels. This firm does a large trade in the Caroline islands, Marquesas islands, Friendly islands and others of the South sea groups, and had experimented for a considerable time with gas engines of European make. They informed us that they had found one or two engines that so far as operation was concerned were all right, but they were lacking in requisite power. They had never heard of a gasoline engine of 60 H.P. or 70 H.P., or, as we make them now, up to 178 H.P., and were skeptical as to the ability of American builders to supply such machines as their needs demanded. We entered into correspondence with them, and as a result contracted to fit out one of their vessels with a 60 H.P. engine. When their schooner came in the engine was installed, and for more than three years—almost four, it is now—it has been in almost constant use. In a word, they were surprised that America could produce anything superior to European manufacture.

"Following the first installation of our machinery, we received additional orders from time to time, until now, I believe, we have equipped practically their entire fleet of vessels with our make of engines. As to the comparative expense of maintenance, I can say this: If the loss of coal in a steam plant is considered, for the time required to generate a head of steam, and also for the time the vessel is not actually under way, during which steam is kept up, the gasoline engine, power being equal, will be found more economical than steam. There is no waste of fuel. When it is necessary to have power a turn of a valve, a spark, and the engine is in full operation. When power is no longer desired, the mere closing of the valve and the turning of the switch stops it, and all use of fuel ceases. Another factor which is largely considered in this connection is the fact that with steam as auxiliary power an engineer and fireman or firemen are required. With the gasoline engine, no addition to the ordinary crew of a sailing vessel is needed, for one man, properly instructed in the starting of the engine, is all that is needed, and he can attend to the whole thing.

"In the matter of room, the gas engine has a great advantage over steam. In the ships we have recently fitted out, the engine room space over all is about 10x12 ft. The storage tanks for gasoline or distillate are not nearly so bulky as boilers, and a vessel equipped with our power has made the run to Honolulu, 2,000 miles, very comfortably by carrying a reasonable reserve supply of fuel in drums on deck. Another great expense to which sailing vessels are continually put is towage. When a vessel of this class seeks to enter a harbor, a tug is necessary, particularly on this coast, but with auxiliary power such as I have referred to above. she can furl her sails, take on her pilot and go in under her own power, even more advantageously than the tug could take her. The saving in this item alone in a few years will offset the cost of an auxiliary plant.

"It has also been found that a sailing vessel equipped with a gasoline auxiliary engine will make a greater number of trips in a given length of time than she could possibly make under sail alone. Calms are overcome and in bad weather, with head winds, she can keep on her course without deviation. This means a greater earning capacity for the vessel and should also be taken into consideration as an offset to the investment required for a plant. Gasoline hoisting engines are coming much into vogue on coastwise vessels, as they are ready to start at an instant's notice, and their expense ceases as soon as the freight is lightered out. There are now on this coast and in the Pacific trade, I should say, perhaps 1,000 vessels of all sizes equipped with gasoline engines. They are in demand from one horse power to several hundred horse power, according to the work required."

### MAN, MUSCLE AND COAL.

The fact that the new steamer Deutschland developed power at the rate of one horse power hour for each one and one-half pounds of coal consumed, says an exchange, is wonderful development in marine boilers and engines. A better showing has often been made in steam vessels, but not of the Deutschland's kind. Static power producers have done considerably better than this. At the Edison power plant power has been developed at the rate of one horse power hour for each pound of coal consumed. Here is an achievement worthy of driving a stake or planting a monument in the highway of civilization. A few easy equations from this starting point will lead us to:

One pound coal equals one horse power hour.

Two thousand pounds coal equals 2,000 horse power hours.

Two thousand pounds equals 200 horse power days of ten hours each.

One horse power hour equals fourteen man power hours.

Two thousand pounds of coal equals 2,800 man power days of ten hours each.

Two thousand pounds coal equals nine man power years of 311 days each.

Value of 2,000 pounds coal, excluding transportation, $1.

Annual production of coal in the United States, 240,000,000 net tons.

Potentiality in man power years of 240,000,000 tons of coal, 2,160,000,000 years.

Ratio between 20,000,000 male workers and the potentiality of 240,000,000 tons of coal, 1 to 108.

That is to say, 20,000,000 workers, without the aid of coal, would have to labor 108 years to develop a force equal to the potential energy of the present annual production of coal in the United States.—Iron and Steel.

The Manhattan & Newark Transportation Co., to operate steamboats, has been incorporated at Trenton, N. J. The capital stock is $150,000, and the incorporators are Wilbur H. Weston, J. S. W. Thompson and F. G. Kimball.

### DOMININION LINER COMMONWEALTH.

The twin-screw steamer Commonwealth will be the latest addition to the ocean liners running between Liverpool and Boston. This steamer belongs to the Dominion line, and was built by Harland & Wolff at Belfast, Ireland. The general design is similar to the popular steamship New England, of the same line, although the new vessel is 600 ft. long, with a tonnage of about 12,000. This vessel is second to none in design and equipment, being fully equal to the finest steamer crossing the Atlantic between New York or Boston and Liverpool. All the latest improvements and the best of naval architecture and marine engineering are combined to produce high speed, absolute safety and comfort of passengers.

The Commonwealth is designed for both passenger and freight service, her immense proportions providing in a liberal manner for both lines of trade. First-class, second-class and steerage passengers will be carried. In a large deckhouse on the hurricane deck is a magnificently fitted saloon for first-class passengers, with accommodation for 200. The elaborate decoration of the interior, soft, rich color, beautiful panels and general artistic effects are enhanced by the lofty dome skylight of rare stained glass. A majority of the staterooms for saloon passengers are located close at hand, with toilet rooms of luxurious design, fitted with all that is latest and best from the highest sanitary and artistic models. The second-cabin saloon is on the deck below and will seat about 100. The fittings here are of great beauty and every attention has been paid to all details which will contribute to the comfort of travelers. On this deck there are many first and second-class staterooms, also engineers' quarters, toilet rooms, pantries, galleys, and all the latest devices for a complete culinary outfit. On the middle deck are located a few staterooms for first-class passengers forward and second-class aft, arranged with reference to convenience in reaching their respective saloons. Aft, is a large, convenient, well-ventilated and lighted, closed steerage, with large deck accommodation and smoking room on deck. The ship is lighted throughout by electricity, and electric bells are placed at all points possible that a perfect, prompt service may be maintained. The refrigerating machinery is one of the most complete outfits ever placed on a ship; meat, provisions or a delicate cargo cannot suffer loss in transit.

The vessel has two pole masts, and will be capable of crossing the Atlantic at any season of the year without cargo if necessary, having water ballast in double bottom and also in deep tanks forward and aft.

There is a grand promenade on the saloon deck, with groups of comfortable seats. Opening from this deck are the handsome entrances to the saloon, lounging room and library, all of which are artistic in decorative treatment, delicate polished woods being used. The captain's room and chart room are located on the boat deck, with pilot-house above. The smoking room opens on the saloon deck and a stairway is also provided to the lower deck for use in bad weather. A large smoking room and ladies' room is provided for second-class passengers on the bridge directly over the saloon.

The Commonwealth is well equipped for rapid loading and discharging of general cargo and well adapted for general transportation. Her propelling engines—two sets—are of the quadruple expansion kind, and her machinery generally is modern in all respects. Mr. Lapsley, chief engineer of the line, has been at the works of Harland & Wolff giving personal supervision to the equipment of the ship in final stages of construction. The new steamer is expected to sail from Liverpool, Oct. 4, and from Boston on her return trip, Oct. 17. The Commonwealth will have as officers Capt. James McAuley, Mr. Latimer, steward, and Mr. Lapsley, chief engineer. Mr. C. P. Jameson is general manager of the Dominion line in Boston, with Mr. Richard Farley as manager of the passenger department. Mr. David Richards of Liverpool is the general manager for Great Britain and the continent.

### LIMITATIONS OF THE SUBMARINES IN WAR.

In a letter addressed to the Rivista Marittima, Signor Giovanni Sechi offers some interesting observations and criticisms on an article which recently appeared in the columns of the great Italian service review on the subject of the functions of submarine vessels in war. Signor Sechi's principal argument against the employment of submarines is the impossibility of getting an extended view from the surface of the water, and he replies to the reasoning of those who assert that the torpedo will become the chief weapon of naval war to the exclusion of the gun, by pointing out that the capture or destruction of an enemy's squadrons is not the end of maritime war, but rather a means of obtaining supremacy on the sea in order to be able to operate freely against an enemy's coasts. Such operations require the employment of numerous and powerful guns, and therefore ships of war armed with an adequate artillery will always have their raison d'être, even if the difficulties which at present limit the employment of submarine vessels should ever be successfully overcome. Another great drawback to the employment of submarines is their very limited speed, which even at the surface of the water has not yet attained a rate of 15 knots. A flotilla of submarine boats could not therefore follow a squadron for the purpose of supporting its attack upon an enemy, nor could one of these boats, when submerged, follow the movements and changes of course of a ship of war for the purpose of discharging a torpedo at her at the right moment. It has been maintained that by using a periscope a submarine boat could remain practically immerged whilst yet able in comparative safety to watch an enemy's movements. Signor Sechi has never made practical trial of the periscope, but is sceptical as to the advantages to be derived from looking through glasses blurred by salt water. Something, indeed, may be seen, but not clearly, and moreover the field of vision will be extremely limited. For the torpedo to be usefully employed in war, two things are necessary—great speed and a wide field of vision. The low speed of submarine boats and the impossibility of seeing to any distance from the surface of the water are, in his opinion, the great drawbacks of the submarine vessel. The first disadvantage may possibly disappear in course of time, but in the present state of science he cannot see by what means the second can ever be remedied. Appliances for indirect vision may do something, but anything of this kind has so far failed to meet the difficulties of the case. For a long time, says the Italian writer, submarine and submergible vessels appear destined to have their role confined to the modest task of port and harbor defence.

### THE THREE VULCANS.

A new ship yard is about to be established on the Scheldt at Hoboken, near Antwerp. The company formed for carrying out this scheme was formally and definitely constituted on Aug. 25 at Antwerp, under the title of "La Société Anonyme Le Vulcan Belge, Chantier Naval et Ateliers de Réparations." The capital will amount to 4,000,000 francs in 8,000 shares of 500 francs each, and the Bremen Vulcan Ship Building Co has subscribed 20 per cent. of the whole, viz., 800,000 francs. The board of directors has the power to increase the capital to 7,000,000 francs if they should think fit. A "Société anonyme" is a company trading under a denomination indicative of its object, and composed of partners bound simply each to pay in his subscribed share, while it is represented by managers or directors personally irresponsible for the liabilities. According to the articles the net profits, after the interest on mortgages and the general expenses are deducted, will be divided as follows: (1) 5 per cent. to the Bremen Vulcan company, and 80 per cent. as an extra dividend of 5 per cent. on the share capital; (3) of the amount in excess of the foregoing requirements 12 per cent. is to be paid to the managers and directors; and (4) the surplus will be distributed as follows; 20 per cent. to the Bremen Vulcan company, and 80 per cent. as an extra dividend to the shareholders. The general plan of the company comprises the installation of a ship building yard, equipped with the most perfect and up-to-date machinery and implements for the building and repair of vessels, including a large dry or floating dock at Hoboken, and the absorption of several repairing workshops in the town situated near the basins. The Scheldt at this spot is about 1,450 ft. wide and 32 ft. deep, so that the largest ocean steamers will find ample accommodation. The public will not be asked to subscribe, all the shares being taken up. The board of directors consists of Messrs. H. Albert de Bary of Antwerp; Colonel Thys of Brussels; Nawatzky, managing director of the Bremen Vulcan company; A. Hertogs of Antwerp; P. Walford of Antwerp; G. Plate, president of the Norddeutscher Lloyd; Schütte, president of the Bremen Vulcan company, and Balser, banker of Brussels. The works are to be pushed on with the greatest energy, the intention being to open the yard within a year from the present time.

The Bremen Vulcan, which has taken such a large interest in the establishment of the Belgian Vulcan, was formed by the amalgamation of the old ship yard of Herr Johann Lange, laid down at Grohn-Vegesack in 1805, and the Bremen Ship Building Co. (formerly H. F. Ulrichs), which was started at Vegesack in 1838. Messrs. D. H. Wätjen & Co., a great Bremen firm of sailing ship owners, were among the founders of the Bremen Vulcan. It is an extensive establishment now, covering a space of about 198,000 square metres, and having a frontage to the River Weser of 1,400 metres, and is provided with everything necessary for the building and fitting out of great ocean steamers. The orders at present being executed at this establishment represent a total value of about 6,000,000 marks ($1,500,000), and the average number of hands employed all the year round is 1,200.

The Stettin Vulcan, which completes the trio, is really a gigantic undertaking. The establishment covers twenty-six hectares of ground and furnishes constant employment for 7,500 hands. Here some of the largest ironclads and mercantile steamers have been built. It occupies the very first rank in the German ship building industry, and the work turned out is probably unsurpassed by that of the most important establishments of the kind anywhere. The company had very modest beginnings, having been formed in 1857, when it absorbed the works of Messrs. Früchtenicht & Brock, set up in 1851 at the little village of Bredow, near Stettin, the capital with which it started being a million thalers. Almost immediately after its formation the Stettin Vulcan undertook the construction of locomotives, the first of which was delivered in 1859. Since then nearly 2,000 have been turned out at these works and delivered to German and foreign railway companies. The capital has been increased successively to 3,000,000 and 6,000,000 marks, but the buildings and the plant, etc., existing at the present day represent a value of at least 24,000,000 marks. The vessels built at these works comprise 250 in all, sixty-two being war vessels of different sizes, 139 screw merchant steamers, and forty-nine paddle boats. Among the war vessels built here may be mentioned seven ironclads of 6,000 to 12,000 tons for the German navy and two ironclads of 7,500 tons displacement for foreign account. The merchant steamers built comprise eight large Transatlantic fast boats, twenty-six large cargo and passenger boats, forty-two medium-sized vessels, fifty small ones and six ice-breakers.—Fairplay, London.

### LENGTHENING A SHIP.

The dividing and lengthening of ships in dry docks, or on hauling-up slip ways, is no uncommon practice, but it is very unusual, if not quite unique, to have this operation performed on the building berth. Recently Messrs. Alexander Stephen & Sons of Linthouse, Glasgow, lengthened by 30 ft. amidships a steel screw steamer of about 6,000 tons, they had on hand to the order of Messrs. Elder, Dempster & Co. The vessel was all but completely plated when the task of lengthening her 30 ft. amidships was resolved on. The hull was cut asunder at the line of butts amidship. Ways, both fixed and sliding, were fitted underneath the after part as in the case of launching. Strong steel hawsers, capable of withstanding an immense strain, were attached at exactly corresponding points on each side, and controlled by firmly fixed steam winches. On the standing ways, 30 ft. distant from the stern post of the vessel, strong stop blocks of timber were securely fastened, and other staying arrangements from them to the ground. When all was in readiness, the after part was released and by its own weight, guided and controlled by the hawsers, it gradually and slowly moved down the ways until stopped by the blocks at the 30 ft. distance. From the moment of release until finally brought up, half an hour elapsed, and after alignment and sighting to make certain of strict continuity, the work of fitting the frames, beams and plating into the gaps was commenced. On the successful and accurate accomplishment of this unique and difficult operation, Messrs. A. Stephens & Sons are to be complimented.—Syren & Shipping.

The navy department has decided to extend the contract time on the torpedo boat Tingey by eleven months, so that the Columbian Iron Works of Baltimore, the contractors, which are in the hands of a receiver, may complete the work on the vessel. It was found that no time could be saved by transferring the contract to a government plant.

### WHY AN ENGLISHMAN BUYS AMERICAN TOOLS.

J. S. V. Bickford of Camborne, England, tells his countrymen in the Engineer of London, issue of August 24, why he buys American tools. "Four years ago," he says, "I had practically not heard of American tools. I was building a shop for experimental purposes. I proceeded to make inquiries and to read up the matter of American tools, and I now have of American manufacture a milling machine by Browne & Sharpe, a wall drill, a cutter grinder, a twist drill grinder, a fan and a sensitive drill. I have a lathe of Manchester make, and, as one instance of its disadvantages, it seems that every handle has been placed where it happens to come, not where it will be most convenient, the result being that I have, rightly or wrongly, come to the decision—'never again an English lathe.' The American, on the other hand, places every handle in reach of the operator, mostly on the front of the saddle. Further, this machine was a shocking time in delivery, whilst American tools can be had per return. After using many hundreds of wheel valves and trying a very considerable number of makers, I have gravitated to Lunkenheimer of Cincinnati, who makes as cheap a valve as I have met, which is at the same time equal to anything on the market. I use Crosby's relief valves. In this instance English makers did not get much of a trial, as Crosby's keep the business through excellence of workmanship and design—the valves are near perfection—and promptness of delivery. I have had one English valve on order for a couple of months, and it is not to hand yet. I am using a Sturtevant fan, which happened to be the first selected, and that on account of the excellent catalogue issued. In considering these cases, the first suggestive fact is, that in all cases in which I find myself with a decided leaning towards a particular product it is a specialty. Thus, the milling machine makers run a special department for every tool they make, which amounts to making a specialty of it. The same applies to American lathes and drills. After most careful study of the question, I have decided on replacing my drill by a Dresser Muller 30-in. radial. These people make only this and one other drill, as far as I know. The faults of my Manchester lathe are all faults of design, and are directly traceable to the makers making every machine tool under the sun. It is perfectly possible for a manufacturer at great expense to turn out all tools, and do it well as far as work is concerned, but no one man under heaven can keep more than a few tools up to date in design. It stands to common sense that if three firms all making three tools were to agree each to make one only, they would turn out better tools and more cheaply. I repeat that the reason for the excellence of the goods mentioned is specialization. Crosbys make only safety valves and one or two kindred things, Lunkenheimer makes only lubricators and valves, Sturtevant only fans, forges, and possibly one or two other specialties.

"There is one more important point which leads to the advantage of the American, and that is, better catalogues—or catalogues giving more details. Brown & Sharpe issue a complete book, describing their milling machines in detail. Does the English manufacturer fear that a rival is going to copy one of his machines from a catalogue description, when he can, for the asking, examine the machine itself at the works of one of his customers? Again, hardly a single English catalogue gives prices. What the reason is I do not know. I may be differently constituted to other buyers, but as a matter of principle I never buy from a catalogue without prices, if I can avoid it and, in addition to this, such a catalogue does not get read to the same extent.

"Finally, the conclusions to which I have come are that the reasons which have led me to buy from America are in almost all cases traceable to specialization. The results are prompt delivery and excellence of design, and also, indirectly, good catalogues, for it is easier to describe one thing in detail than a dozen. If the English maker wants to get back the trade which is going to the States, he must specialize. It may be objected to the above that I have not given English goods a fair trial. My answer is that I am not an exhibition jury, but a manufacturer. When I want an article, I take the first good one I can meet, and too often this is foreign made. Advertisement, in which the American seems to excel, is part of a manufacturer's business. You cannot possibly advertise one hundred different tools properly at a remunerative figure."

### INVESTING MONEY IN MERCHANT VESSELS.

The following letter which Mr. J. S. Stevens, Jr., of Philadelphia, vice-president and general manager of the Atlantic & Pacific Co., wrote to the editor of Syren & Shipping of London is interesting also to Americans:

"Dissatisfaction with the size of their merchant marine is general with Americans. The condition is not hard to explain, as for thirty years the development of their home market has given full scope to the capital and energy of the people. Our peculiar system of tariff laws has also turned the attention of American people inwards instead of outwards. It is only in the last few years that the United States has developed sufficient capital to seek investment in new channels, and even yet the tide of foreign capital is flowing into the United States. The conditions are changing, however, and American capital is now seeking investment wherever it can profitably be made, and with the acquisition of the Hawaiian islands, the attention of the American manufacturer has been turned towards trans-oceanic business.

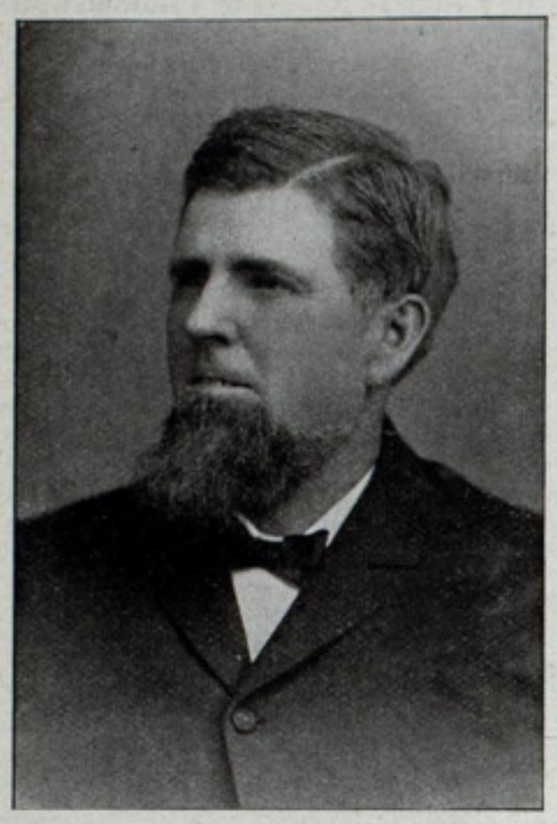
"It is the hope of all shipping people in the United States that our capitalists may be induced to invest their money in merchant vessels, and a campaign of education is under way in this particular. While it is possible for Englishmen to accuse us of short-sightedness in slavery to the 'tariff habit,' it can also be said that the American people are not slow to realize a mistake, and when the realization comes, there will be a surprising activity in the construction of American vessels. Certainly no more profitable field for investment of this character can be found at this time, when the commerce of the world is being gradually revolutionized.

"The writer was informed by one of our American shipping men, who controls several large steamers, that he was now able to charter his vessels for foreign business at a figure which would yield him an increased profit of $100,000 per annum."

The United States commission for the Paris exposition have notified The George F. Blake Manufacturing Co. that they have been awarded the "Grand Prix" for their exhibit of pumps. Mr. F. Meriam Wheeler, manager of the marine department of this company, received a silver medal as the originator and patentee of many of the marine specialties built by this company.

### CAPT. JAMES LAWLESS.

They're disappearing one by one, these hardy masters of sailing vessels on the Great Lakes. James Lawless of Vermillion, captain of the ill-fated schooner John Martin, is one of the latest to go. He went down with the ship. Man and boy he had been working on the lakes for over fifty years. He was born in 1838 at Niagara, Ont., and spent his teens in working for the old French ship builder, Schicluna, at St. Catherine's. He acquired a good working knowledge of the art of building wooden ships, which is largely a manual employment, before he went to Vermillion to live. There he sought and found employment with the elder Bradley, and continued in the employ of the son when the elder died. He married Eliza Harris at Vermillion and made the place his permanent residence. His career on the lakes was varied. He had his share of knocks. He was among those caught in Lake Superior in the year of the great freeze—the year the Sault froze up tight before its time and left scores of ships and men there. Hundreds of them were without provisions and it was a case of come home or starve to death. Lawless crossed the Straits of Mackinac in a small boat and started across Michigan on snow shoes. After days of hardships he managed to reach a logging camp near Saginaw. Several who attempted a similar trip died on the way; but Lawless was magnificently endowed physically. He was a giant both in stature and strength. As a man he was impulsive, generous and erratic; as a captain he was tireless in his labors and never knew a task too great to undertake. Two or three years ago he lost the steamer E. B. Hale in Lake Huron, but managed to save his crew. With the Martin he was not so fortunate. The waters claimed them both.



### INDUSTRIES ALLIED TO SHIP BUILDING.

Great strides have been made in the last few years by the industries allied to the ship building trade in Germany as a result of the extension of the ship yards and the increase in their business. The consumption of iron in the building of large merchant vessels in Germany has almost doubled in ten years—from 45,000 tons in 1890 it rose to 85,000 tons in 1899. In the same, and in some cases to a superior degree, the demand for objects of all kinds used in the fitting and equipment of ships has grown, and in these branches, as well as in the supply of materials for building the hulls, the demand is covered in a steadily increasing degree by the home industries. What are known under the generic term of "fittings," articles required for the equipment of ships, such as capstans, winches, pumps, cooking apparatus, etc., had either to be obtained from England or ordered in Germany at a much greater cost, but now these things are turned out by specially established German factories. Some of these factories, indeed, have not only proved their capability of covering the home demand but have even been executing orders for British ship builders. The progress made in this respect in Germany is remarkable, and the principal factories and foundries in Hamburg, Geestemünde, Hanover, Lübeck, Rostock, Berlin, Danzig, etc., have all been considerably enlarged to enable them to cope with their extended business. The cabinet-making, upholstering and decorating trades have received an extraordinary impulse from the important orders placed with them by the large ship building companies for the furnishing and embellishing of the splendid saloons and cabins on board the new transatlantic liners built in Germany, and the number of establishments affected to these branches is constantly increasing. From the time iron began to be used in ship building, a large number of factories occupied with the production of the necessary objects and articles stood at the disposal of British ship builders, and from these for a time German ship builders got their supplies, but this has been altered within the last few years, and Germany has become independent of us in this respect.—Fairplay, London.

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The Verity patent flexible shaft coupling—John Verity, Sheffield, England, patentee—is now being fitted on and specified for the shafts of the great majority of the large cargo and passenger steamships. Experiments with this coupling were begun about eleven years ago, the steamers Pocahontas and Pocassett being fitted with crude flexible couplings of the Verity type. The present coupling is much improved and after running successfully on several well-known large vessels for years its success is assured. Among other vessels the St. Louis and St. Paul, four Red Star liners and two Cunard liners are fitted with these couplings and several other well known shipping lines are installing them in their latest vessels. The indications are that all first-class passenger and cargo steamers built within a few years will be fitted with flexible shaft couplings of an approved type. The failure of shafts, particularly tail shafts, during the past few years, is convincing proof that flexible couplings in one or two places in the length of a shaft are absolutely necessary.

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A new chart of the Apostle group of islands, drawn on a large scale, has just been published. It shows shallow spots known as York island and Bear island shoals that are not marked on any of the old charts. These are shallow places on the course to Ashland found by the steamer Roumania last season and by the steamer John Mitchell only a short time ago. The Mitchell has just left the dock after paying a large repair bill, due to striking on one of these shoals, which are about 2¼ miles due north of York island and 3¼ miles west of Bear island, or E. by N. ½ N., 4½ miles from Sand island light.

### AROUND THE GREAT LAKES.

The propeller Atlantic, thirty-seven years old and for many years classed as uninsurable, has been rebuilt at Bay City by the Bay City Dry Dock Co. and actually given a rating of A1 star. This sounds incredible, but the rating was given by Capt. A. B. Drake, chief inspector for the Inland Lloyds, who inspected her. He says it is one of the best repair jobs he ever saw. It is but safe to say that but little of the original wood is in her now. The rebuilt vessel has been named Homer Warren.

Attorneys Harvey D. Goulder and John Shaw and Messrs. Geo. L. McCurdy, W. E. Fitzgerald and W. B. Castle interested as attorneys, underwriters and owners in the Denver-Specular collision dispute, held a meeting in Cleveland, Monday, with a view to agreeing upon a settlement for the loss of the Specular, which was sunk by the Denver in Pelee passage, Lake Erie, a short time ago. Progress was made in the negotiations, and it is hoped that the matter will be settled out of court. There is no hope of raising the Specular.

Capt. George P. McKay of the Lake Carriers' Association received word on Wednesday that the Canadian government had marked the Lime Kiln crossing with buoys as follows: The eastern edge of the cut will be marked by three red spar buoys, moored respectively at the upper end, in the middle and at the lower end of the Canadian side of the dredged deep channel. The buoys will be moored in 20 ft. of water, as close to the rock side of the cut as possible, and this side of the cut should be favored by upward bound vessels. The two lights vessels maintained by the American government will, as heretofore, mark the west edge of the channel.

Francis J. Clergue of Sault Ste. Marie, Ont., who represents Philadelphia capitalists in the development of large water power enterprises at the Sault and in the opening up of iron mines at Michipicoten on the north shore of Lake Superior, has taken novel means of transporting locomotives and cars to the Algoma Central Railway in the new mining district. Two car ferry barges, owned by the Lake Michigan Car Ferry Transportation Co., are now on their way from South Chicago to Michipicoten, bearing two complete railroad trains. The barges are being towed by the tug J. C. Ames, and the trains which they are carrying include two complete locomotives, set up and ready for running, forty-eight freight cars of the flat variety, and two passenger coaches. The harbor at Michipicoten is now without rail connection with the outside world, and so all supplies are shipped in by boat. The car ferry barges being designed for this work with tracks on their decks were chartered, and loaded the outfit at South Chicago. The cars were built by the Pullman company and the locomotives at the Baldwin works at Philadelphia.

Mr. H. A. Foss, whose vigilance in the conduct of affairs of the weighmasters' department, Chicago Board of Trade, has caused vessel men to place great reliance in the grain-weighing force at Chicago, spent a couple of days in Cleveland last week following up some irregularities that must attend this kind of work. The vessel part of Mr. Foss' duties is, of course, much larger this season than it was in 1899, on account of the great outflow of grain by water from Chicago. Last year the railroads got far more than their usual share of the grain to haul to the seaboard, on account of the high lake freights that prevailed throughout the season. Grain shipments by lake from Chicago last week reached the unusually large total of 6,718,984 bushels. This was carried away by sixty-seven ships, or an average of nearly ten each day. Of this total, about one-half was corn, the exact figures being 3,387,889 bushels. There were 1,444,749 bushels of wheat, 1,791,709 bushels of oats, and 94,637 bushels of flaxseed. Some of the large cargoes were: S. S. Curry, 175,000 bushels of corn; Sir Henry Bessemer, 220,600 bushels of corn; Stephenson, 220,000 bushels of corn; Selwyn Eddy, 150,000 bushels of corn; Aurania, 180,000 bushels of corn; Crescent City, 123,000 bushels of corn and 117,000 bushels of oats; Amazon, 60,000 bushels of wheat, 75,000 bushels of corn, 175,000 bushels of oats; W. D. Rees 150,000 bushels of corn, 65,000 bushels of wheat.

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### LAUNCH OF THE BAGLEY.

The new torpedo boat Bagley was launched from the yard of the Bath Iron Works, Bath, Me., Monday afternoon, in the presence of a large crowd. The vessel, which was named for Ensign Worth Bagley, the Spanish war hero, was christened by Mrs. Josephus Daniels, a sister of the late ensign. Among the decorations were floral offerings from naval officers and from Ensign Worth Bagley Camp 6, Legion of Spanish War Veterans, of Bunker Hill district, Boston. Commander Willis W. Stover, commander of the camp, and a delegation were among those present. Mrs. Bagley, mother of the ensign; Mrs. Benjamin Miffitt, Dudley H. Bagley of Richmond, Va., Cadet David W. Bagley, and Mr. and Mrs. Josephus Daniels, Raleigh, N. C., were among the guests of the builders. The Bagley is one of three vessels of the torpedo type contracted for by the Bath Iron Works in 1898, the other two being the Barney, which was launched last July, and the Biddle, which has not yet been completed, but which, it is expected, will be ready for launching next month. The dimensions of the Bagley are: Length, between perpendiculars, 157 ft.; beam, molded, 17 ft.; depth at centre, amidships, 10 ft. 9 in.; mean draught on trial, 5 ft. 8 in.

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### NAVAL CONSTRUCTOR HOBSON EXPLAINS.

Naval Constructor Hobson, who gave an interview upon his arrival at Vancouver, B. C., recently, which, in the form it was printed, seemed to belittle Admiral Dewey's victory at Manila, reported to the Brooklyn navy yard for duty Tuesday. "I think Admiral Dewey's victory the greatest ever won," said Lieut. Hobson. "The admiral's work has been underestimated. No other naval battle has ever been won in which the victor escaped without injury, and I am proud of his work and so is the whole navy." Mr. Hobson then narrated the circumstance of the Vancouver interview. He said that in reply to a question from a correspondent there he said that he had been raising Spanish warships, which led the correspondent to ask if they had not been sunk by Dewey's shells.

"I replied," said Lieut. Hobson, "that they had not been, but that the Spaniards had sunk their own vessels by opening the seacocks. I was careful, however, to explain right there that it was Admiral Dewey's shell fire that caused them to do this. Everyone who knows anything about warships well knows that in a smooth sea they cannot be sunk by direct fire. Unless you knock a hole in a ship below the water line she will not sink unless her magazine explodes. Admiral Sampson did not sink Cervera's squadron, but no one belittles his victory on that account."

### NORFOLK SHIP BUILDING AND DRY DOCK CO.

On the property bought a few days ago from General V. D. Groner of Norfolk, Va., by Charles S. McCulloh there will be erected in a short time a mammoth marine railway by the Norfolk Ship Building Co. The property is situated on the Elizabeth river just beyond Fort Norfolk and is considered an ideal spot for a railway of the kind contemplated. It has already been surveyed and plans and estimates have been drawn up for the plant. The site cost $50,000. The shipping interests of Norfolk, Portsmouth and Hampton Roads have long felt the necessity of a properly equipped plant for docking and repairing steamers and sailing crafts of a larger tonnage than that which the few marine railways located there have been able to handle. Although the local floating equipment has increased during the last five years between 400 and 500 per cent., there has not been any increase in the number of plants, nor in their capacity. All boats in those waters are compelled to haul out from three to four times annually on account of the rapid growth of barnacles and sea grass, and it has been the experience of those having a large amount of floating property that they have been subjected to great loss by worms striking their boats before they were able to have them hauled out and painted, by reason of the few plants located there and their rushed condition. For this same reason the charges are high and a great deal of work has been driven from Norfolk to Baltimore, and in many cases even as far north as Philadelphia. Norfolk has ten railroads, eleven steamship lines, seven tug boat agencies, four barge companies, seven ferry lines and several hundred of oyster and truck vessels, and by nature of the port, each railroad and steamship company is compelled to have a large number of tugs and barges. Besides this large home fleet there are never less than from forty to seventy large schooners lying at anchor in harbor. It is proposed by this company to construct a plant which will be superior to all the other plants combined, and it has organized with this object in view, and secured a charter.

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The annual meeting of the American Boiler Manufacturers' Association in Cincinnati last week was well attended. The election of officers resulted in choice of the following: President, Richard Hammond, Buffalo; vice-presidents, J. Don Smith of Charleston, S. C.; M. G. Weidner of Chattanooga, Tenn.; Clifford M. Tudor of Cincinnati; James Morrison of Pittsburg and W. J. McAleenan of Peoria, Ill.; secretary, J. D. Farasey, Cleveland; treasurer, Joseph F. Wangler, St. Louis.

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The steamships Chatfield, Arlington and Leonora have been chartered to carry to Great Britain from Philadelphia great quantities of steel for the Carnegie Co. of Pittsburg. It is reported that others are under engagement. One consignment has already gone. The entire contract is said to amount to 100,000 tons of billets for ship builders, sheet steel for tinplate works and binder slabs and crop ends to be made into structural steel. The charters are said to extend over a year.

### BABCOCK & WILCOX BOILERS.

The latest order secured by the Babcock & Wilcox Co. from the navy department is for water tube boilers for the new cruiser Cleveland. Babcock & Wilcox boilers are now under construction for the monitor Wyoming and cruisers Cincinnati, Raleigh, Tacoma, Galveston, Chattanooga, Denver and Des Moines. Two freight steamers for the International Steamship Co., building on the lakes but intended for Atlantic coast service, are being equipped with these boilers. The list of lake freight steamers already using Babcock & Wilcox boilers includes the Zenith City, Queen City, Crescent City, Superior City, Empire City, Alex McDougall, Presque Isle, Mataafa, Maunaloa, Malietoa, John W. Gates, James J. Hill, Isaac L. Ellwood, Wm. Edenborn, W. S. Grattan, Harvard, Lafayette, Cornell, Princeton and Rensselaer.

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The new North German Lloyd steamship Princess Irene, which finished her maiden voyage from Bremen and Cherbourg to New York last week, encountered the cyclone that ravaged Galveston. She was delayed nearly a day breasting heavy seas. She made the trip in 8 days and 15 hours. She will ply hereafter between German and Chinese ports. She is a steel twin screw of 10,900 tons gross, and is fitted with quadruple expansion engines of 9,000 H.P., which are expected to give her a speed in pleasant weather of 17½ knots. She has accommodation for 300 first cabin, 100 second cabin and 1,500 steerage passengers.

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### VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of September 26, 1900.

| NAME OF STOCK. | OPEN | HIGH | LOW | CLOSE |
|---|---|---|---|---|
| American Steel & Wire..... .... | 30¼ | 30¾ | 29⅞ | 30⅜ |
| American Steel & Wire, Pfd..... | 71⅜ | 71⅜ | 70½ | 70½ |
| Federal Steel ..... | 31¼ | 31¼ | 30⅝ | 30¼ |
| *Federal Steel, Pfd..... | 61½ | 61½ | 61¼ | 61½ |
| National Steel ..... | 24 | 25 | 24 | 25 |
| National Steel, Pfd..... | 83 | ..... | ..... | 83 |
| American Tin Plate ..... | 25 | 26 | 25 | 26 |
| American Tin Plate, Pfd..... | 77⅛ | 77¼ | 77⅛ | 77¼ |
| American Steel Hoop..... | 18½ | 18½ | 18 | 18 |
| American Steel Hoop, Pfd..... | 65 | ..... | ..... | 65 |
| Republic Iron & Steel ..... | 10¾ | ..... | ..... | 10¾ |
| Republic Iron & Steel, Pfd ..... | 51½ | ..... | ..... | 51½ |

*Ex Dividend 1½%.


Paris Exposition, 1900, confers HIGHEST AWARD and GOLD MEDAL
(Only Gold Medal in this Class)

ON CHICAGO

OUR NEW SHELL RIVETERS
USED IN CONNECTION WITH OUR NEW LONG STROKE HAMMER
ECLIPSE ALL PREVIOUS DEVICES
FOR SHIP YARD WORK.....

PNEUMATIC TOOL CO.

UNITED STATES COMMISSION
TO THE
PARIS EXPOSITION OF 1900

PARIS 10 AVENUE KLEBER | CHICAGO AUDITORIUM BUILDING | NEW-YORK EQUITABLE BUILDING

PARIS OFFICES,

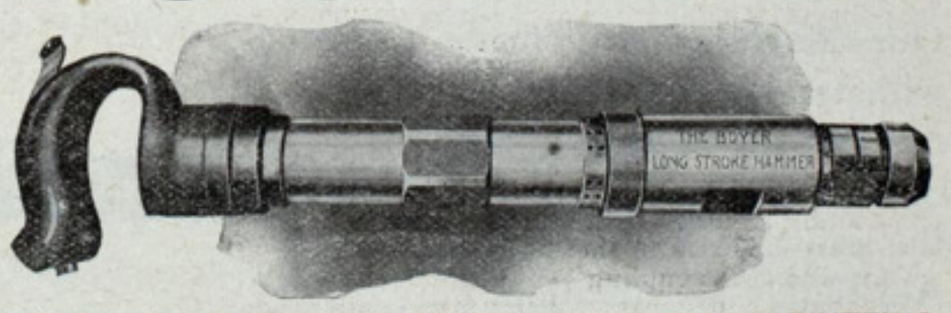
August 21, 1900.

Chicago Pneumatic Tool Company,
Chicago.

Gentlemen:

Officially I desire to inform you that your pneumatic tools received at the hands of the International Jury of Award, a Gold medal. Also that Mr. Boyer was awarded a Gold Medal as collaborator and inventor of the tools.

Yours very truly,
F E Drake
Director of Machinery & Electricity.




HAMMERS: NEW BOYER LONG STROKE RIVETING HAMMER. DRIVES RIVETS UP TO 1 INCH BY HAND; 1 1-4 INCH IN FRAME. ADAPTED TO ALL KINDS OF RIVETING, INCLUDING STEAM-TIGHT BOILER WORK. NINE-INCH STROKE. ESTIMATED SPEED 800 PER MINUTE. WEIGHT 18 POUNDS. SMALLER SIZES FOR LIGHTER WORK.

DRILLS: ADAPTED TO ALL PURPOSES, IRON, STEEL OR WOOD.

PORTABLE OIL RIVET HEATING FORGE: BURNS FUEL OIL OR KEROSENE. HEATS 500 RIVETS PER HOUR. ABSOLUTELY UNDER CONTROL OF THE OPERATOR. ECONOMICAL AND EFFICIENT.

PNEUMATIC APPLIANCES SENT ON TRIAL SUBJECT TO APPROVAL.

CHICAGO PNEUMATIC TOOL CO., General Offices, Monadnock Block, Chicago. New York Office, 95 Liberty St.

## ATLANTIC AND PACIFIC COAST.

A FEW NEW SHIP YARD CONTRACTS ARE TO BE NOTED—VESSELS FAST LEAVING THE STOCKS.

The New England Co., Bath, Me., launched the new four-masted schooner J. Edward Drake, a few days ago. The Drake is one of the finest schooners ever built in a Bath ship yard. She is of the following dimensions: Length, 182.6 ft., breadth, 37.3 ft., and depth, 17.5 ft. Her gross tonnage is 910.64, and net tonnage 789.32. The carrying capacity is about 1,400 tons. She was built for the general coastwise trade. She will be commanded by Levi S. Wiley, formerly of the schooner Cactus. This vessel has been constructed of selected material and put together in the substantial manner characteristic of the New England company's methods of building vessels. The Drake has an oak keel, hard wood and hackmatac frame and yellow pine planking 4½ in. thick from garboard to gunwale, all composition fastened. The masts are Oregon pine, all 94 ft. long and 26 in. in diameter. The rigging is wire. The cabin is finished in quartered oak and sycamore, and the staterooms are in white wood. The vessel has a Hyde windlass outfit. She was rigged and ready for sea when launched. She is owned by James B. Drake and others of Bath. Mr. Drake is managing owner.

Wilson Rickenbach, at his ship yard in North Camden, N. J., launched lately a new barge of large size, which is intended for the North Carolina and eastern coast lumber trade. She is 180 ft. long, 23 ft. 6 in. beam, and 12 ft. depth of hold. The new boat can carry 500,000 ft. of yellow pine, or 1,000 tons of coal. Mr. Rickenbach is now getting out the frame for a new wooden tugboat which will be a duplicate of the Curtin, launched two years ago, and which is accounted one of the finest on the Delaware river. The new boat, which will be named Minnie, is to be 90 ft. long, 19 ft. 6 in. beam, and 9 ft. depth of hold. She will be used in towing barges between North Carolina and Philadelphia. The engine and boiler and a large wrecking pump will be placed in her by the Neafie & Levy Ship & Engine Building Co. at Philadelphia.

William E. Palmer of Boston has contracted with George L. Welt of Waldoboro, Me., for the construction of another five-masted schooner of 4,000 tons coal capacity, to be named the Baker Palmer. The keel for the vessel will be laid as soon as the Fannie Palmer, now on the stocks, is launched next month.

The William R. Trigg Co., Richmond, Va., has been awarded the contract for the construction of the new steamship for the Chesapeake & Ohio Railway Co. The vessel will be named Virginia and when completed will give the Chesapeake & Ohio two steamships on the Norfolk and Newport News route.

The new tug Osgar G. Murray for the Baltimore & Ohio railroad was launched a few days ago from the yards of the Spedden Ship Building Co., Baltimore, Md., in the presence of a large number of invited guests. It was also the occasion of Capt. R. M. Spedden's birth, and the event was duly celebrated by a luncheon in the ship loft after the launch. The tug is 105 ft. long, 22 ft. beam and 12 ft. 6 in. depth of hold.

The new ship building plant of the Risdon Iron Works of San Francisco will be built by the American Bridge Co. of New York, and will consist of a boiler shop, machine shop and foundry, all of the latest design and most modern description.

The New York Ship Building Co., Camden, N. J., began last week to punch plates for its first ship and will within a few days lay its first keel. The contract for this vessel was secured some time ago from M. S. Dollar & Co., San Francisco.

A large six-masted schooner building at Percy & Small's yard, Bath, Me., will be named Eleanor A. Percy in honor of the daughter of S. R. Percy of the firm of Percy & Small. The vessel will be launched about Oct. 10.

The United Engineering & Contracting Co., New York, has secured the contract for furnishing a pumping plant for dry dock No. 3 at the Brooklyn navy yard. The contract price is $79,435.

Charles White at Everett, Wash., will lay the keel for a four-masted schooner 208 ft. over all, 39 ft. beam and 14 ft. 4 in. depth of hold. She will be managed by Capt. John Peterson and others.

Matthew Turner, at Benecia, Cal., has launched the new four-masted schooner Ariel. She is 190 ft. long, 40 ft. beam, and 14 ft. depth of hold. She has a capacity of 900,000 ft. of lumber.

The new schooner Edith H. Symington of 1,000 tons burden was launched from the ship yard of W. S. Currier & Co., Newburyport, Mass., this week.

The Harlan & Hollingsworth Co., Wilmington, Del., has just launched the second of the steel barges for the Rockport & Rockland Lime Co.

Messrs. McKay & Dix have decided to build two vessels at their yards at Bucksport, Me., next season.

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Plans for the League island electrical workshop for the new equipment building, to cost $84,000, have been sent to Washington. The officials at the navy department are in possession of plans for an $18,000 boiler house to complete the storehouse alongside the reserve basin. Bids for the $100,000 new marine barracks have been opened. The drawing of plans for the $113,400 combustible shed and cooper, block and spar house and the $500,000 steam engineering plant is now under way. Plans for the other work that is to be done under the $2,000,000 appropriation now available, not including the $1,175,000 for the concrete and granite dry dock, will be rapidly turned out, so that the work can soon be commenced.

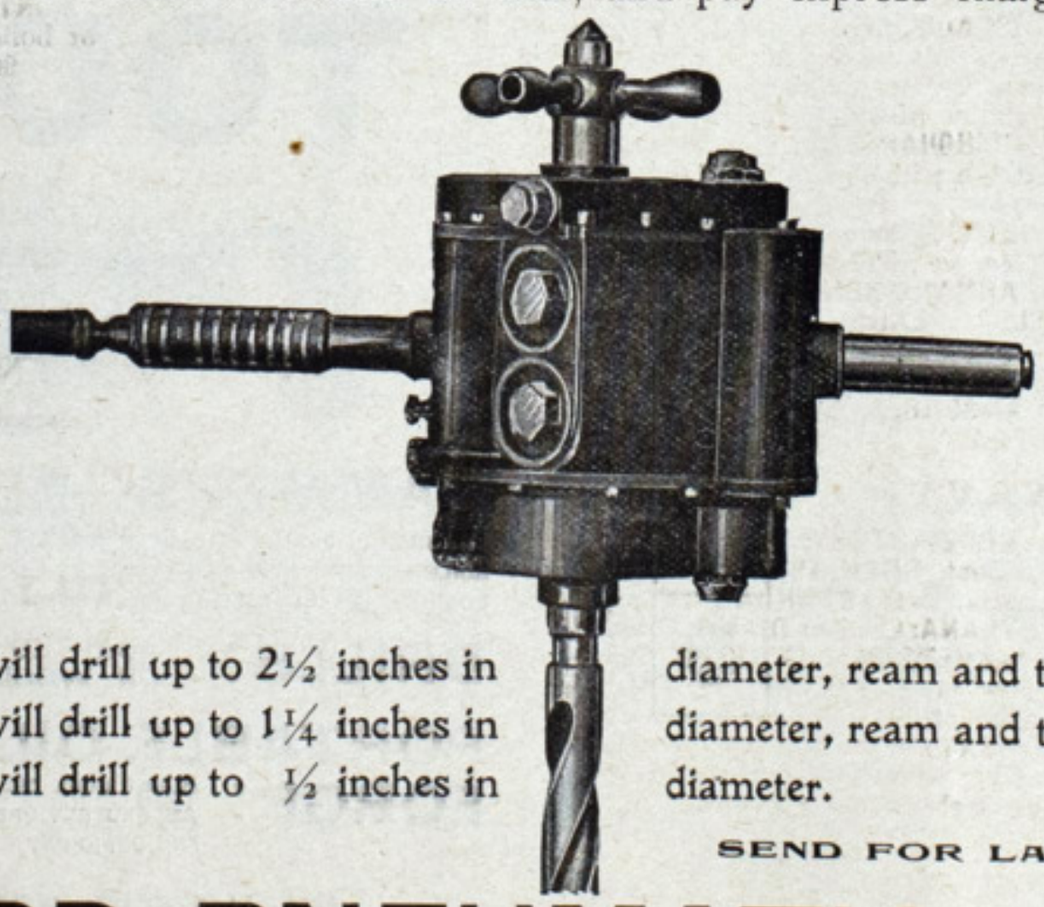

THE ONLY PISTON AIR DRILLS

That have Double-Balanced Piston Valves are the

"LITTLE GIANT"

*SPECIALLY DESIGNED FOR SHIP BUILDING.*—They consume fifty per cent less air and do far more work than rotary or any other type of air drills. If you want to verify this we will send a machine on trial, and pay express charges both ways.

Our Machines are made to withstand hard service. They can be operated in a bath of oil. Used by 85 per cent of the railways in this country. Absolutely no vibration.



Guaranteed against repair for one year. Made entirely of steel. Can be operated close to a corner and in any position. We can furnish them in any size.

No. 1.—Weight 27 lbs., will drill up to 2½ inches in diameter, ream and tap up to 2 inches.
No. 2.—Weight 17 lbs., will drill up to 1¼ inches in diameter, ream and tap up to 1 inch.
No. 3.—Weight 8 lbs., will drill up to ½ inches in diameter.

SEND FOR LATEST CATALOG.

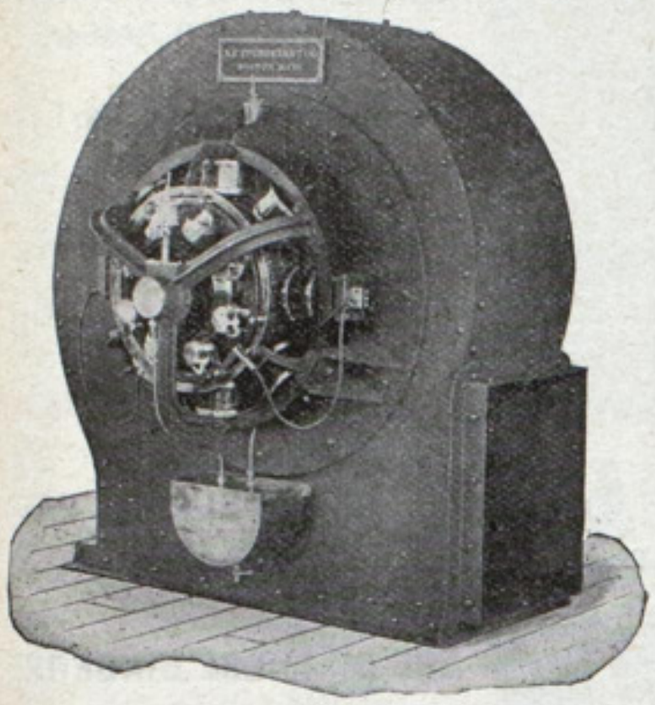
STANDARD PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools of All Kinds,

Marquette Building, CHICAGO. 141 Broadway, NEW YORK.

### COMPACT STEEL-PLATE ELECTRIC FAN.

The electric fan herewith illustrated presents novel features, particularly as regards its compactness. The shell is of familiar construction, being of steel plate. To this shell, upon the closed side, is bolted a cast iron plate carrying three lugs, within which is centered and held the eight-pole Sturtevant motor. The field ring and field cores of the latter are of wrought iron, the pole shoes being of cast iron and of such shape and size as to render the machine capable of extreme variation of load without sparking at the brushes, and without necessity of adjustment.



The field coils are thoroughly insulated and machine wound, being mounted on cores from which they may be readily removed. The open construction presents a great amount of radiating surface, thereby preventing the accumulation of heat. The armature, which is necessarily the most vital part of the machine, has been very carefully designed with special reference to low speed and high efficiency. Laminated slotted discs, mounted on a cast iron spider, form the core. These discs are solidly clamped between brass rings, which support the edges of the core and protect the teeth from being damaged or misplaced, while presenting a smooth and well-rounded corner for the support of the slot insulation. The construction of these cores and the manner of applying the coils is such that all parts are thoroughly ventilated, so that there is no danger of overheating, even when overloads are carried for a considerable period of time.

The commutator is of large diameter and consists of pure-rolled or drop-forged copper segments, supported in a cast iron shell of spider construction. Carbon brushes are used and are supported upon a special rigging which is carried by brackets attached to the field ring. A spider attached to each side of the field ring forms at its center a journal box, which is provided with oil reservoir and ring oiler. The entire apparatus was designed and built by the B. F. Sturtevant Co. of Boston, Mass.

### TRADE NOTES.

The American Bridge Co. announces that Mr. August Ziesing has been appointed as the general western representative of the company, with headquarters at Chicago.

Mr. F. A. Barbey has been appointed representative of the Standard Pneumatic Tool Co. for the New England states. The Standard company has opened an office at No. 185 Sumner street, Boston.

The Phosphor-Bronze Smelting Co., Ltd., 2200 Washington avenue, Philadelphia, Pa., original manufacturers in the United States and sole makers of "Elephant brand" phosphor-bronze, have issued a very tasty little price list; and also rules to be observed upon ordering.

The Cleveland Punch & Shear Works Co. report that they are running their plant at full capacity and have made this month the following shipments of tools: A 20-ft. plate planer to Seiders & Co., East Stroudsburg, Pa.; 50-in. rotary planer with 12-ft. bed to L. B. Hoffman, Flemington, N. J.; 30-in. throat punch to the Brown-Ketcham Iron Works, Indianapolis, Ind.; two 26-in. punches to the American Bridge Co., Youngstown plant, and one 48-in. double punch and shear, and one 26-in. punch to the Eastern Ship Building Co., New London, Conn.

U. S. Engineer Office, 185 Euclid Ave., Cleveland, O., September 8, 1900. Sealed proposals for constructing breakwater and piers at Black River Harbor, (Lorain) Ohio, will be received here until 2 P. M., standard time, Monday, October 8, 1900, and then publicly opened. Information on application. Jared A. Smith, Col., Engrs. Oct. 4.

U. S. Engineer Office, Jones Building, Detroit, Mich., Sept. 22, 1900. Sealed proposals for removing wreck of schooner "Fontana" in St. Clair River, Mich., will be received here until 12 noon (standard time), Oct. 2, 1900, and then publicly opened. Information furnished on application. G. J. Lydecker, Lt. Col., Engrs. Sept. 27.

U. S. Engineer Office, Detroit, Mich., Sept. 14, 1900. Sealed proposals will be received here until 12 noon, Oct. 30, 1900, and then publicly opened, for furnishing material and labor of all kinds necessary to construct and put in operation one large steel hulled self-propelling sea-going hydraulic dredge, with all necessary appliances complete, including electric light plant, distilling and refrigerating machinery. Information furnished on application. Thos. H. Handbury, Major, Engrs. Oct. 18.


# BELLEVILLE GENERATORS.

*GRAND PRIZE AT THE WORLD'S FAIR OF 1889.*

**List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.**

## FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS, SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY, AMIRAL AUBE** and **MARSEILLAISE.**

**COMP. GENERALE TRANSATLANTIQUE**: X, steamer of the Tarn class.

**MESSAGERIES MARITIMES**: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LA-CIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE.**

**COMPAGNIE DES CHEMINS DE FER DE L'OUEST**, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS, CAEN, BREST, CHERBOURG**; Fast Steamers **TAMISE, MANCHE, FRANCE.**

## RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PALLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE.**

## ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACCHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGU**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

## AUSTRIAN NAVY.

**BUDA-PEST**, iron clad coast guard; **KAISER KARL VI**, cruiser, **X', X'''**, battleships.

## ITALIAN NAVY.

**VARESE**, cruiser; **BENEDETTO BRIN**, battleship.

## ARGENTINE REPUBLIC.

**PUEYRREDON**, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA.**

## SPANISH NAVY.

**REINA REGENTE**, cruiser.

## CHILIAN NAVY.

**O'HIGGINS**, cruiser; **ALMIRANTE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **JENERAL BAQUEDANO**, school ship.

## JAPANESE NAVY.

**SHIKISHIMA**, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship; **IZUMO**, cruiser.

## UNITED STATES OF AMERICA.

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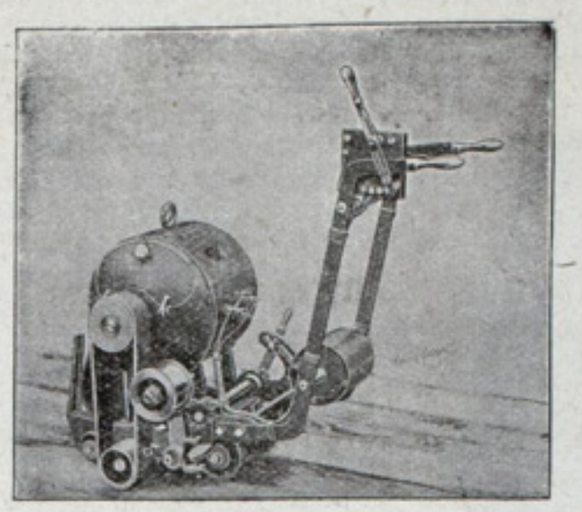

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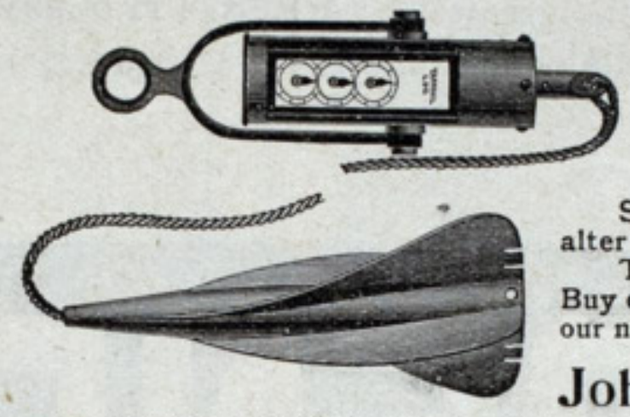

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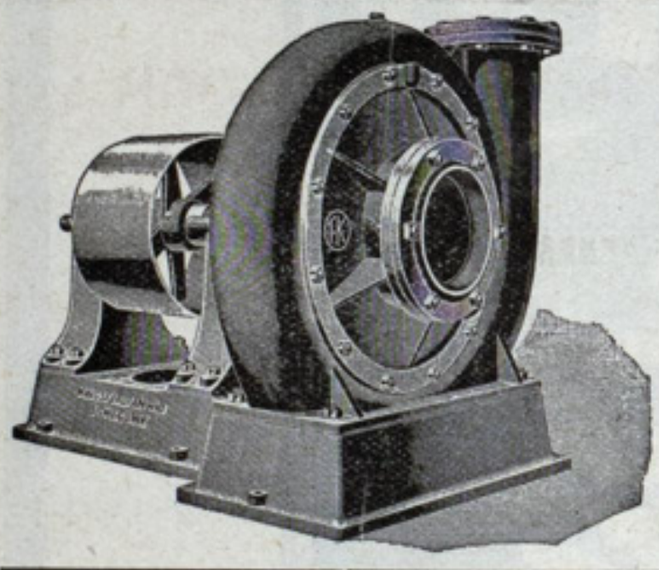

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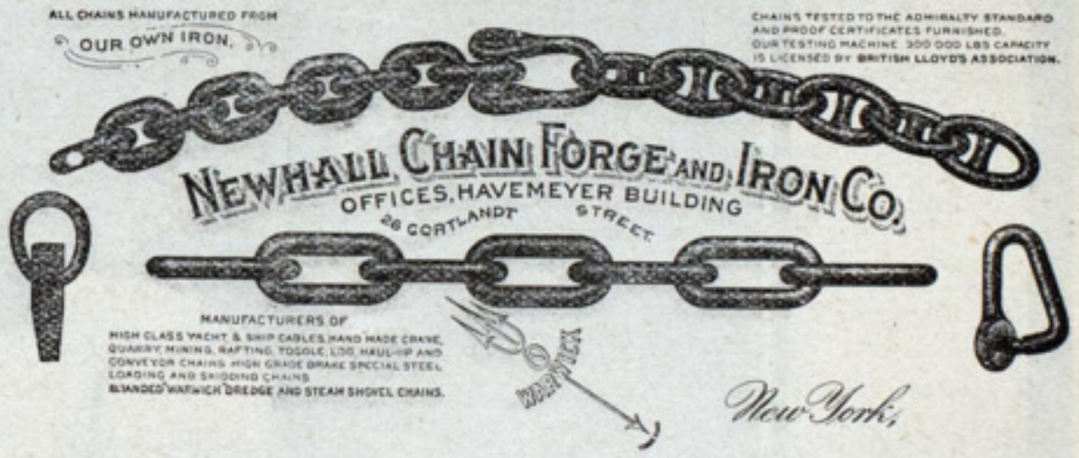


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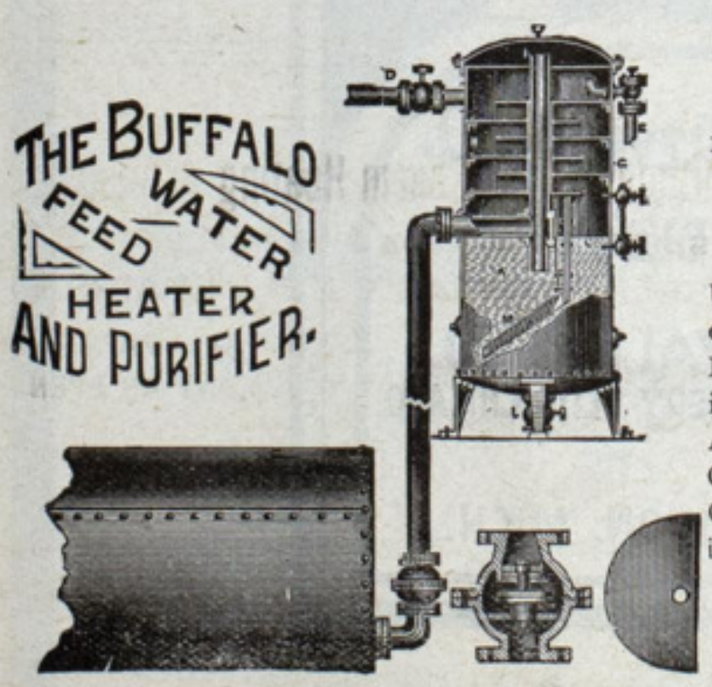


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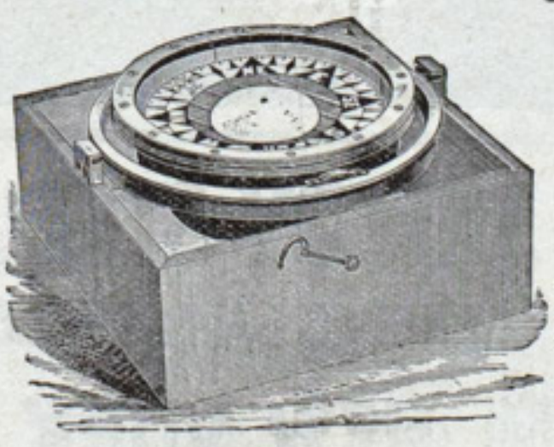

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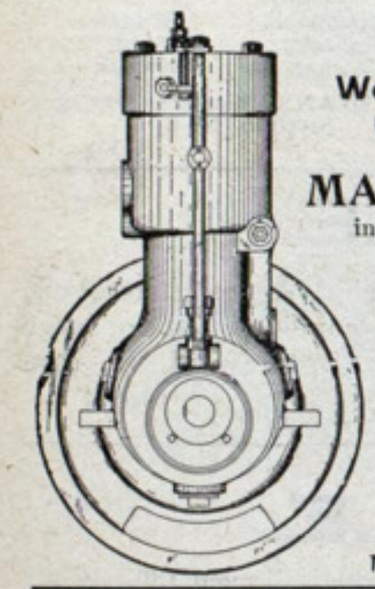

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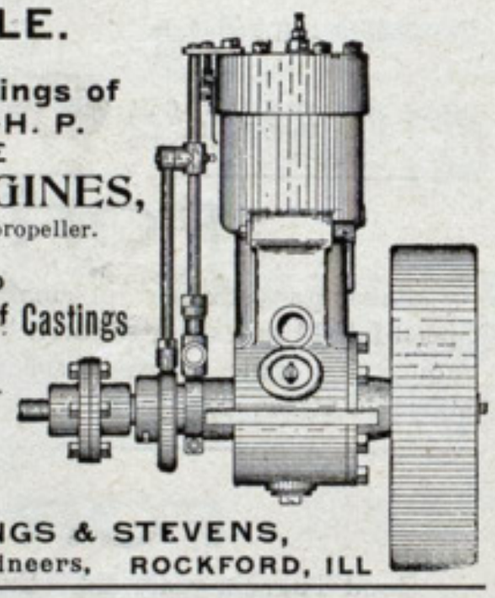

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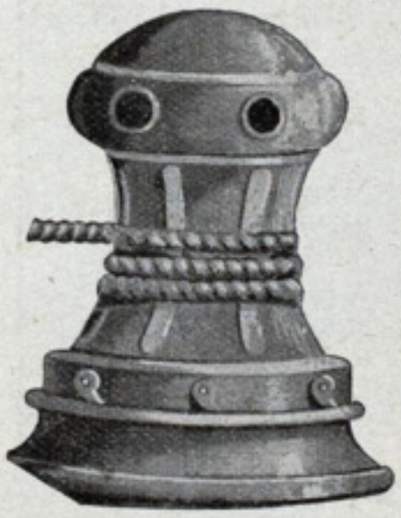

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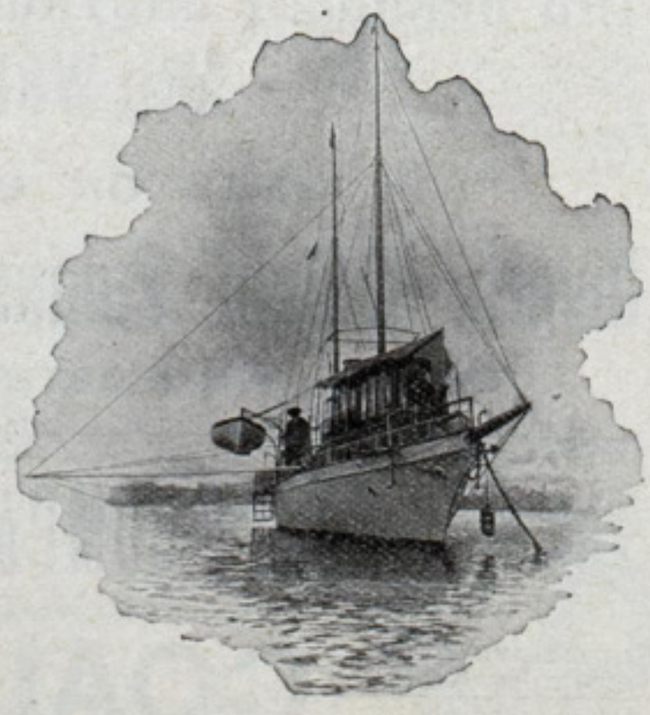

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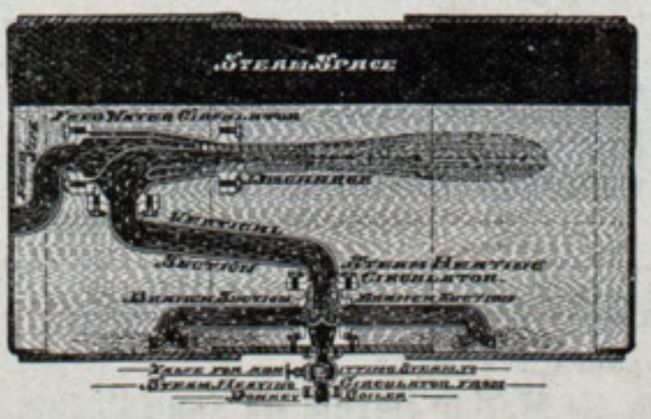


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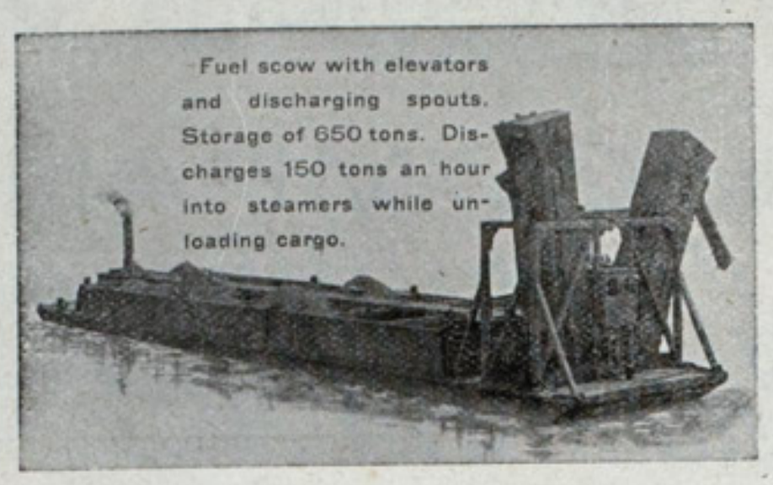

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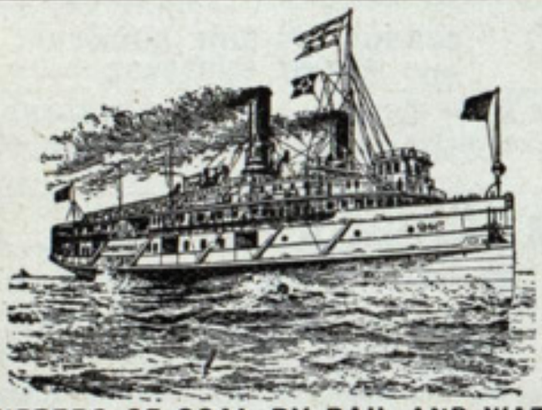

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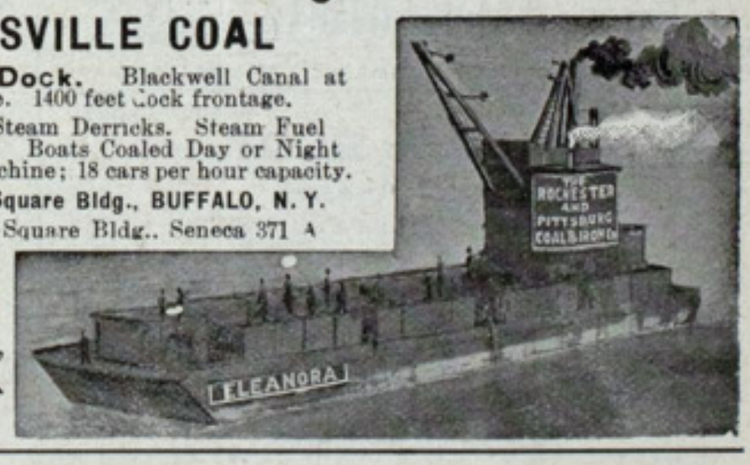


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Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

### ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

### ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

### ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

### ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.

### ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Giddings & Stevens.....Rockford, Ill.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Simpson, W. L.....5th and Buttonwood, Philadelphia.
Wood, W. J.....Chicago.

### FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

### FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

### FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

### FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland

### FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

# BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

### FLUSHOMETERS.
Kenney, The Co.....New York.

### FURNACES FOR BOILERS.
Continental Iron Works.....New York.

### FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.. .....Chicago.

### GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

### GAS AND GASOLINE ENGINES.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co..... .....Cleveland.
Olds Motor Works.....Detroit.

### GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

### GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

### HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

### HAMMERS, POWER DROP.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

### HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

### HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

### HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co... .....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co..... .....Cleveland.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.... ...Pittsburg.

### INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

### INJECTORS.
Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

### INSURANCE, MARINE.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys..... .....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H..... .....Chicago.
Pauly, H. J.....Milwaukee.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

### IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

### IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

### LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

### LAUNCHES—NAPHTHA, ELECTRIC.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

### LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

### LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

### LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

### MACHINE TOOLS.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.

### MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

### MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

### METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

### METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

### METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

### MILLING MACHINES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

### NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

### NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
See, Horace.....New York.
Wood, W. J.....Chicago.

### NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

### OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

### OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

### PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

### PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

### PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

### PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

### PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A..... .....So. Boston.

### PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

### PLANERS OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

### PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

### PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

### PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co..... .....Chicago.

### POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

### PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co..... .....Weymouth, Mass
Hardy, John B..... .....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

### PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

### PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works..... .....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

### PUNCHES, RIVETERS, SHEARS.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

### REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

### RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

### RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

### RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

### RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

### SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

### SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

### SALVAGE COMPANIES.
See wrecking companies.

### SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.
International Correspondence Schools.....Scranton, Pa.

### SCREW MACHINES.
Niles Tool Works Co.....Hamilton, O.

### SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

### SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

### SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

### SHEARS.
See punches, riveters and shears.

### SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

### SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co .Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co..... .....Chicago.

### SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co..... .....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

### SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

### STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

### STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

### STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

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**STEAMSHIP LINES, PASS. AND FREIGHT.**
American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

**STEEL SHAFTS, SOLID OR HOLLOW.**
Bethlehem Steel Co.....So. Bethlehem, Pa.

**STEERING APPARATUS.**
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co. .....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

**STOCKS, BONDS, SECURITIES.**
Wright, Herbert & Co.....Cleveland.

**STOCKLESS ANCHORS.**
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

**STRUCTURES OF STEEL, BUILDERS OF.**
American Bridge Co.....New York.

**SURVEYORS, MARINE.**
Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

**TELEGRAPH—DECK AND ENGINE ROOM.**
Cory, Chas. & Son.....New York.

**TESTS OF MATERIAL.**
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

**THERMOMETERS FOR MECHANICAL PURPOSES.**
Helios-Upton Co.....Peabody, Mass.

**TIMBER—LARGE PIECES.**
Moran Bros. Co.....Seattle, Wash.

**TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.**
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

**TOOLS, WOOD WORKING.**
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

**TRUCKS.**
Boston & Lockport Block Co.....Boston, Mass.

**TOWING MACHINES.**
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

**TOWING COMPANIES.**
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

**TUBING FOR BOILERS.**
Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

**TUBES, SEAMLESS DRAWN, BRASS AND COPPER.**
Hungerford Brass & Copper Co., U. T.....New York.

**VALVES, STEAM SPECIALTIES, ETC.**
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

**VARNISH MAKERS, COLOR GRINDERS, ETC.**
Smith, Edward & Co.....New York.

**VARNISH PAINT.**
Mair, John & Son.....Philadelphia.

**VESSEL AND FREIGHT AGENTS.**
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

**VENTILATING APPARATUS FOR SHIPS.**
Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

**WIRE ROPE AND WIRE ROPE FITTINGS.**
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

**WHISTLES, STEAM.**
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

**WINDLASSES.**
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

**WINCHES.**
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

**WOOD WORKING MACHINERY.**
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

**WORM GEARING.**
Morse, Williams & Co.....Philadelphia.

**WRECKING AND SALVAGE COMPANIES.**
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

**YACHT SAILS, FITTINGS, HARDWARE, ETC.**
Wilson & Silsby.....Boston.

**YACHT AND BOAT BUILDERS.**
Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

**YAWLS.**
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

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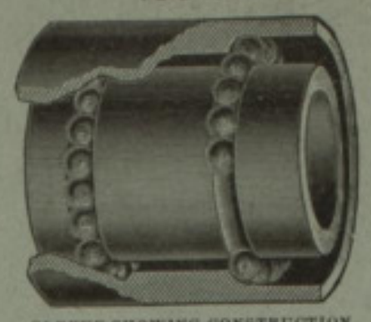

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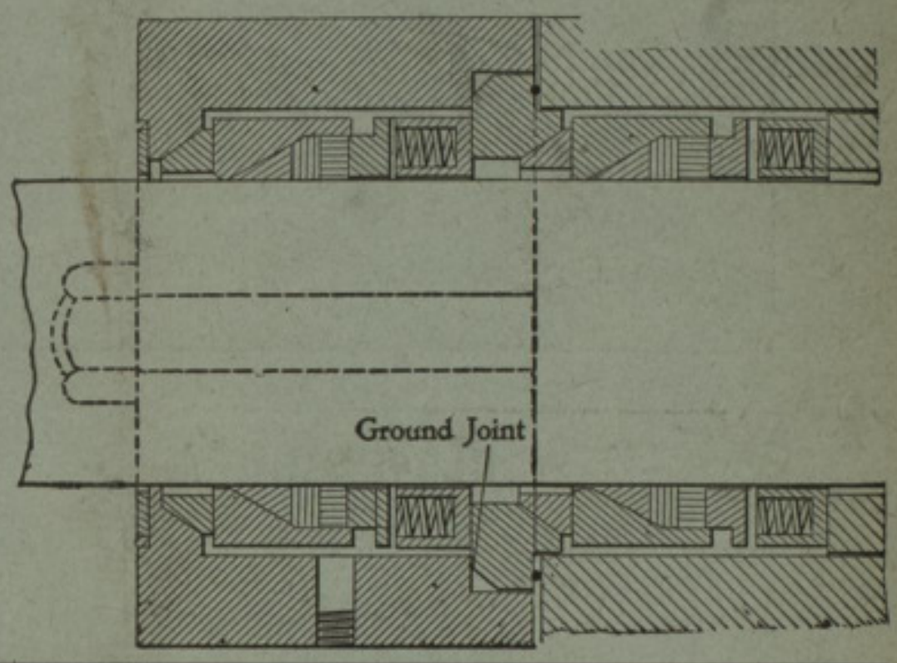


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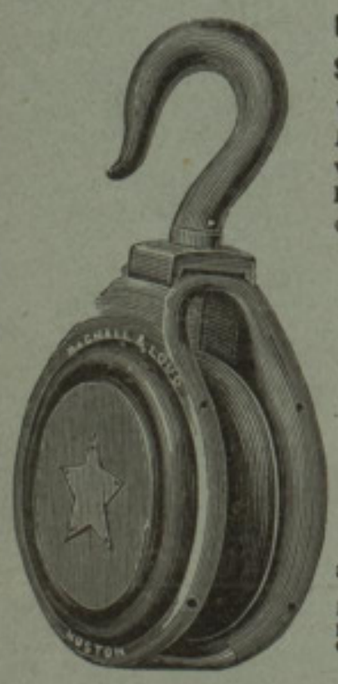

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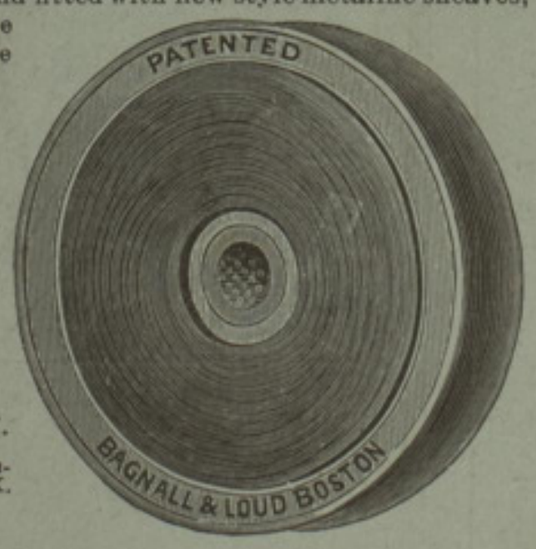


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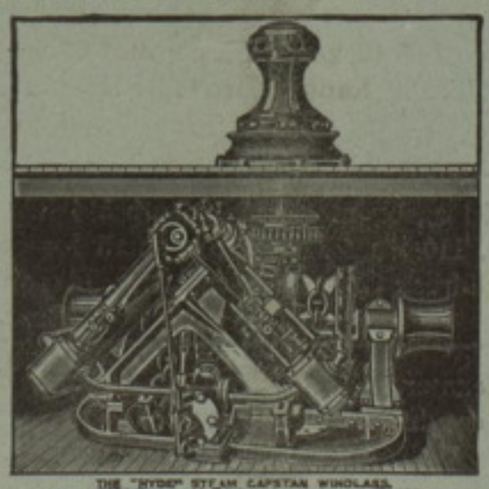

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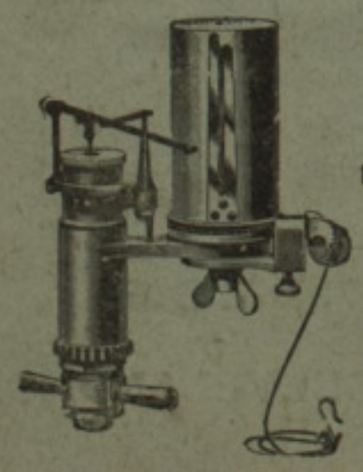

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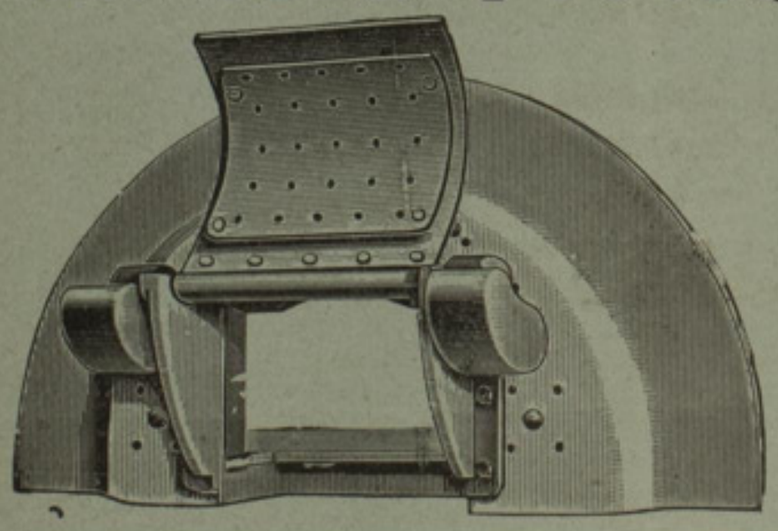

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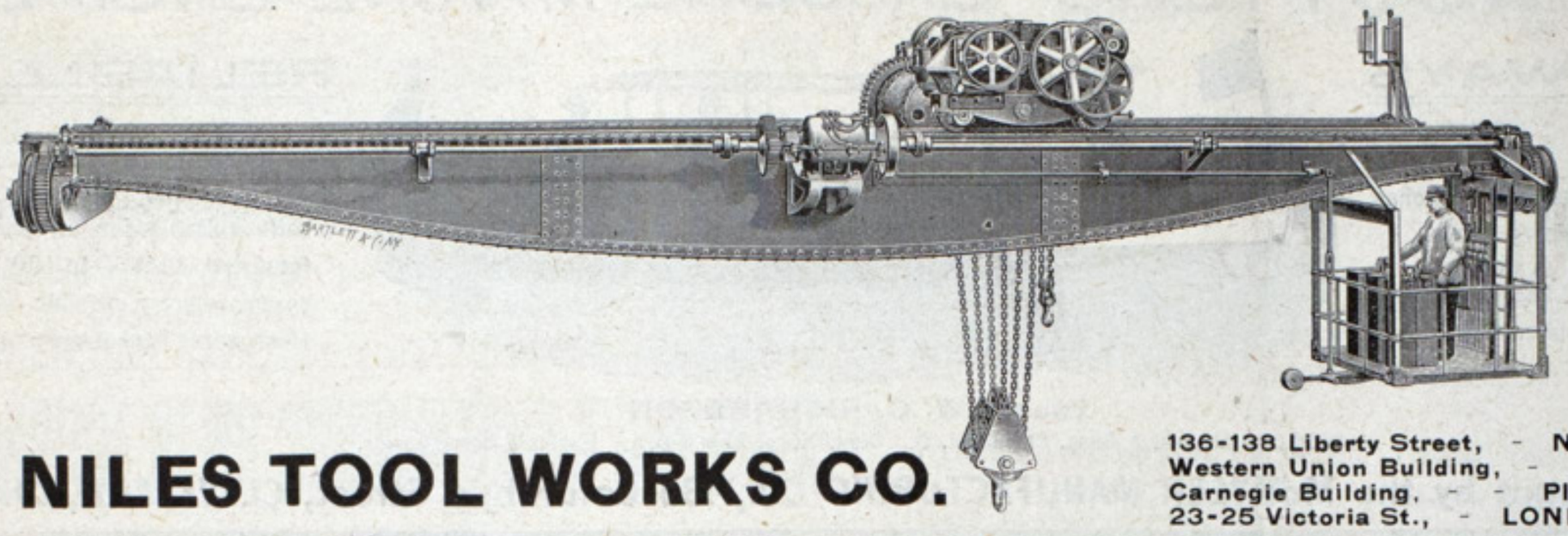

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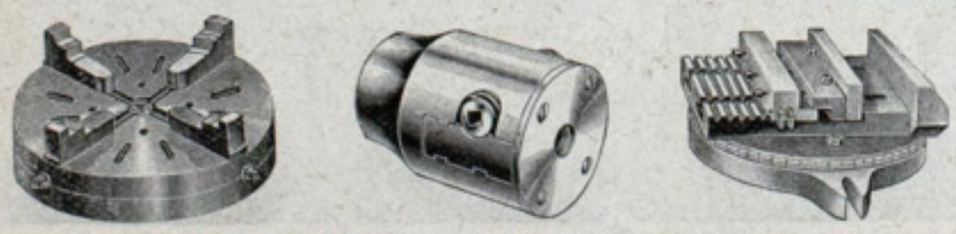

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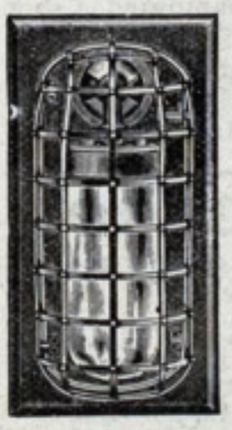

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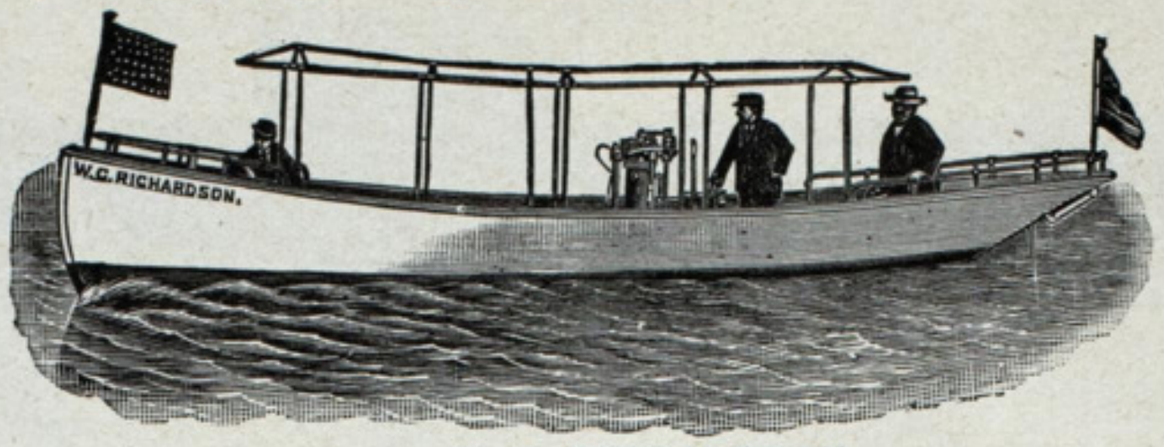


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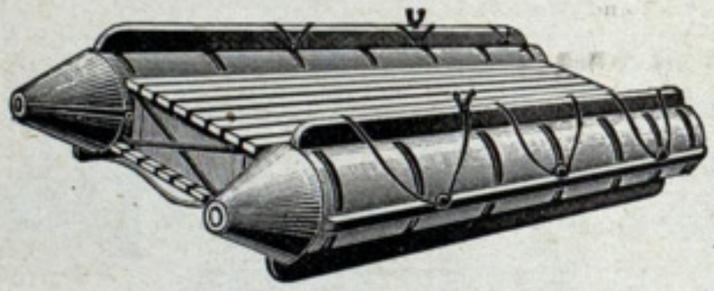

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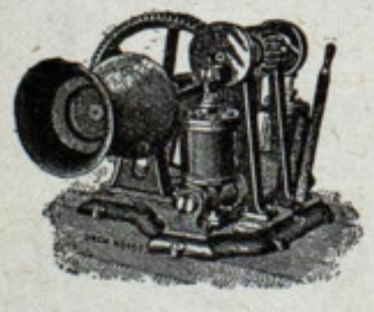

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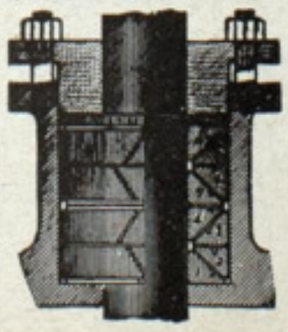

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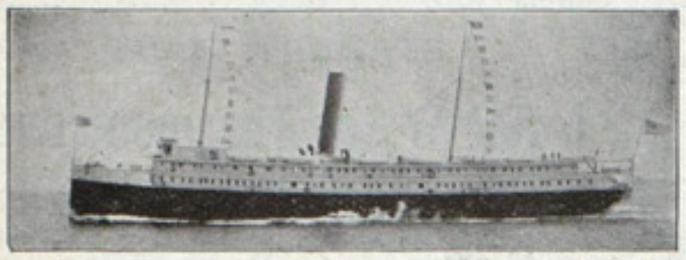

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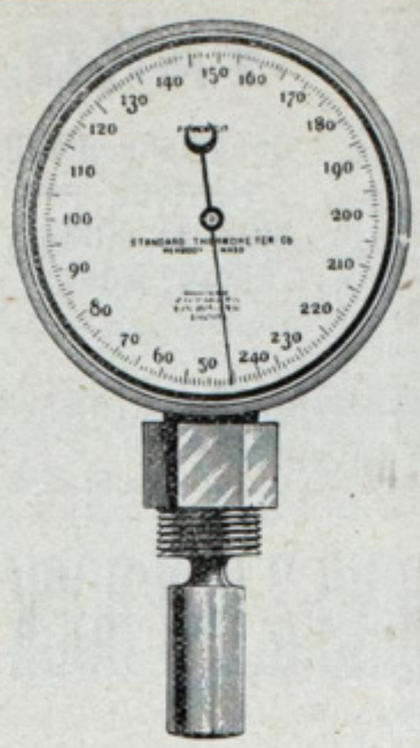

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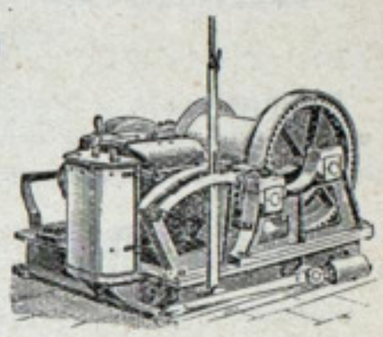

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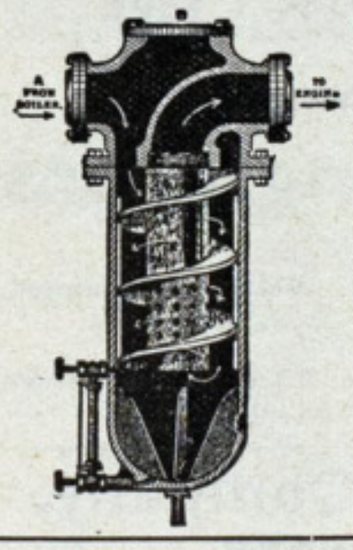

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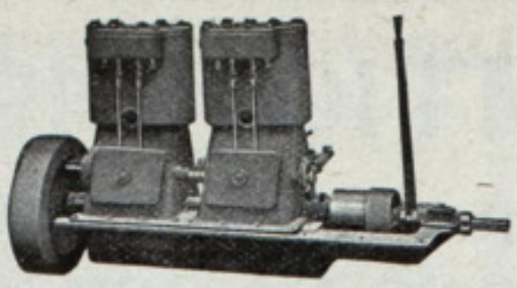

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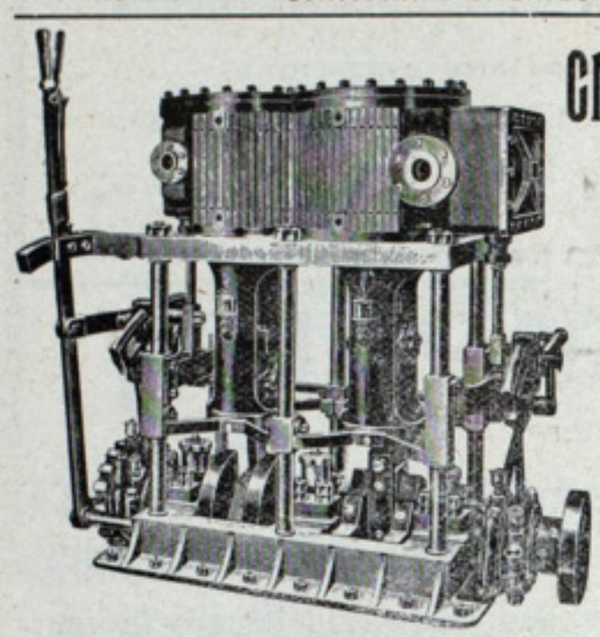

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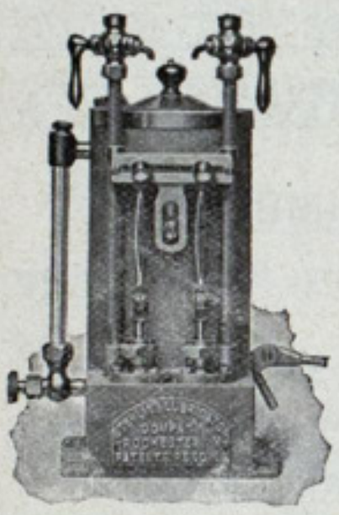

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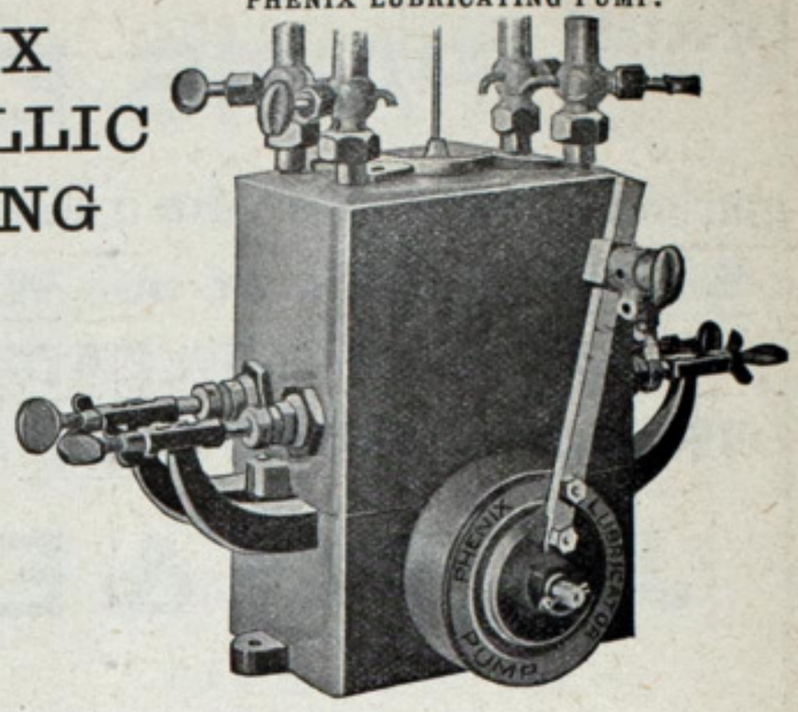


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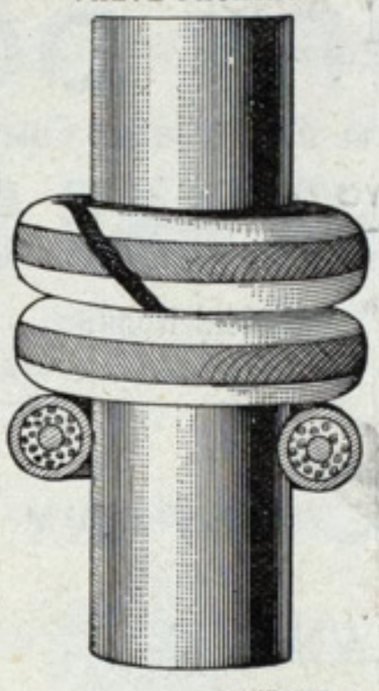

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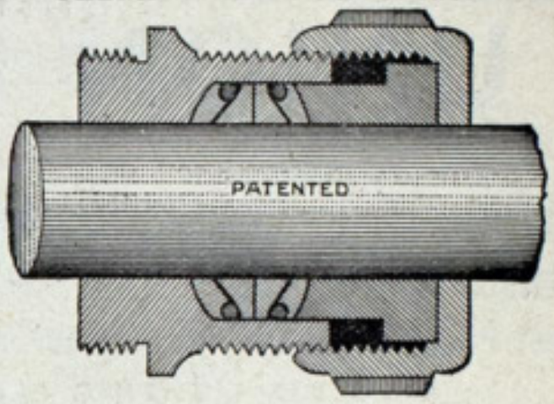


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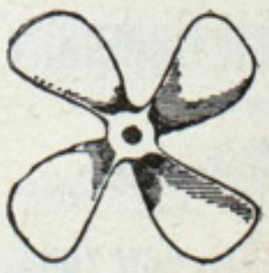

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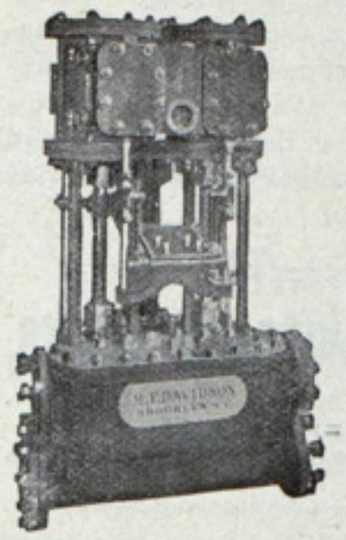

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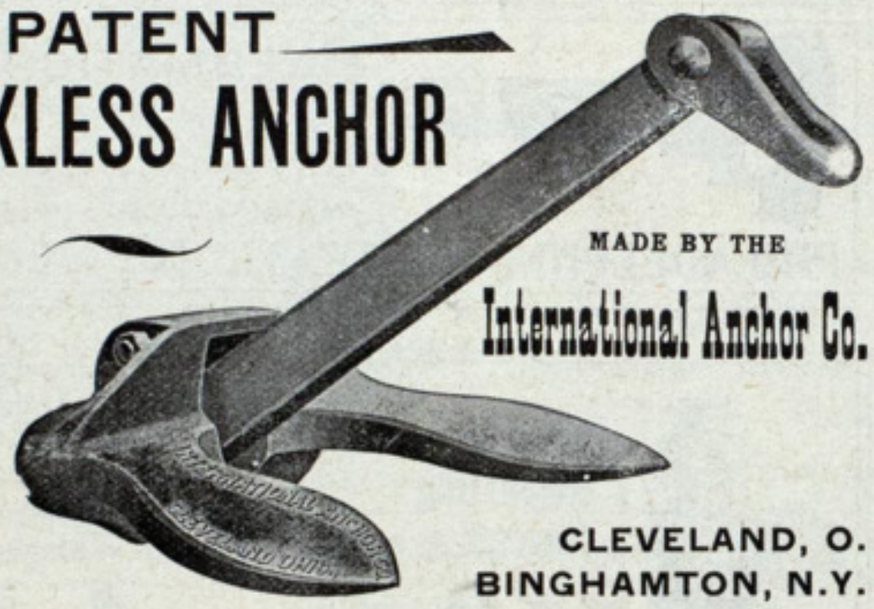

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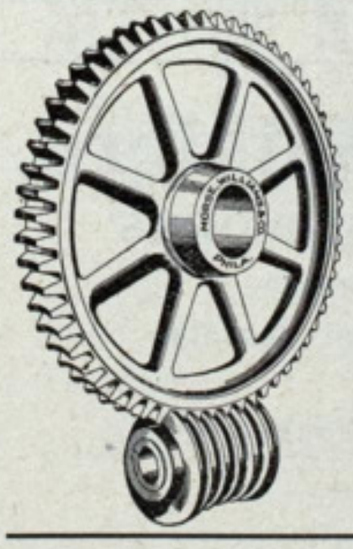

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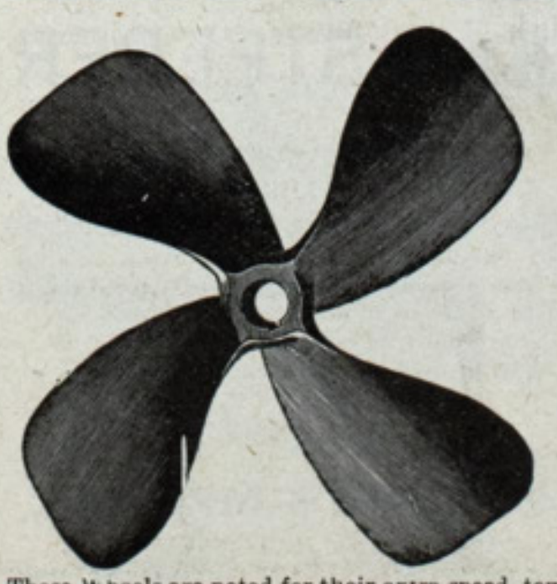

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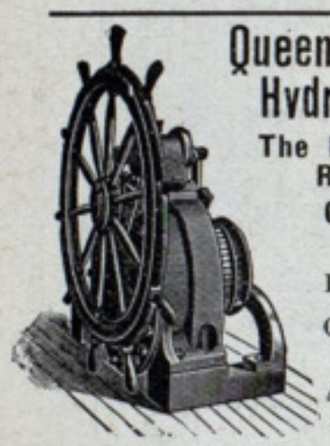

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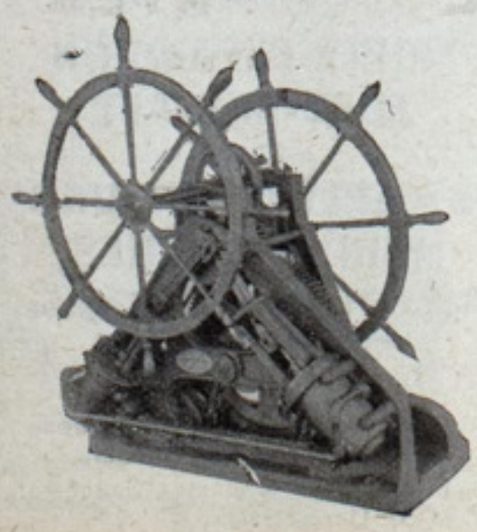

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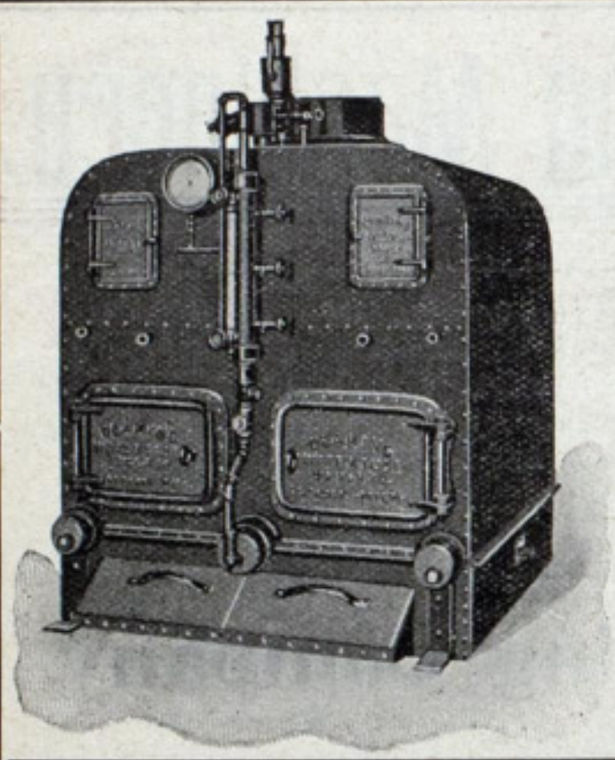

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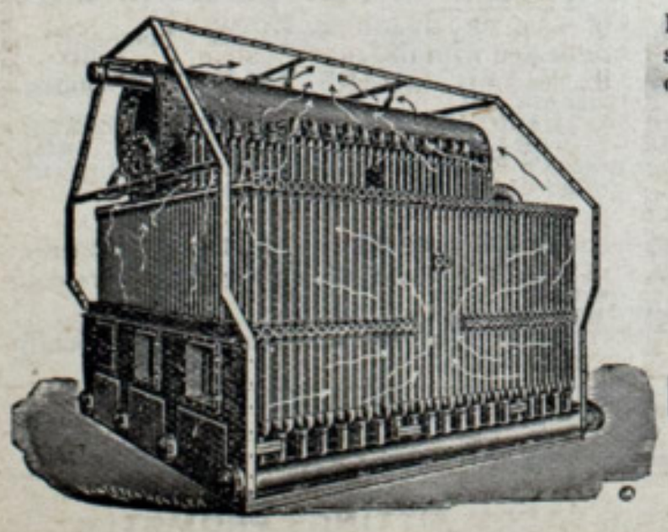

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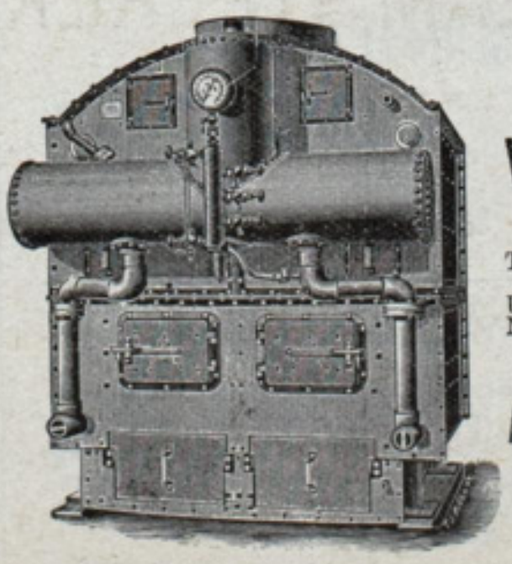

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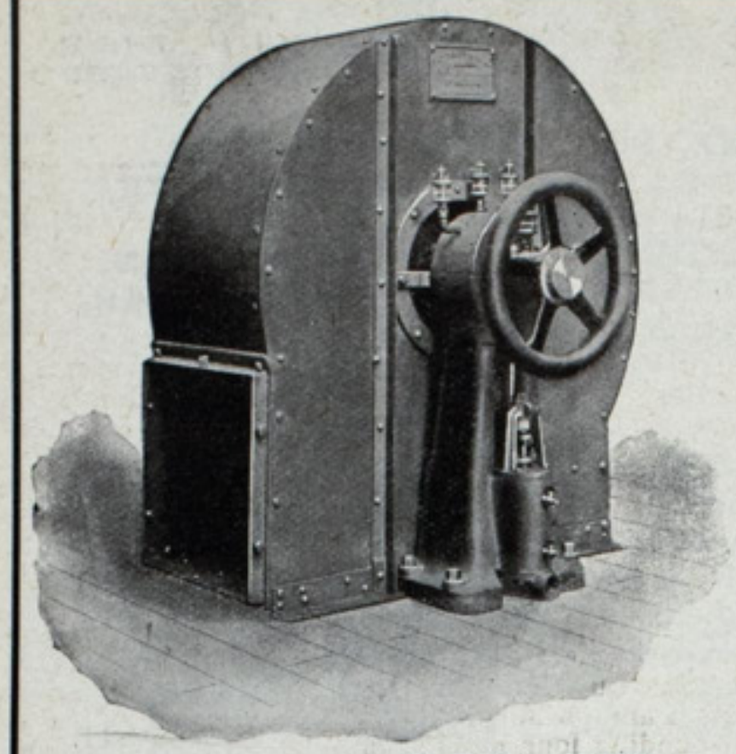

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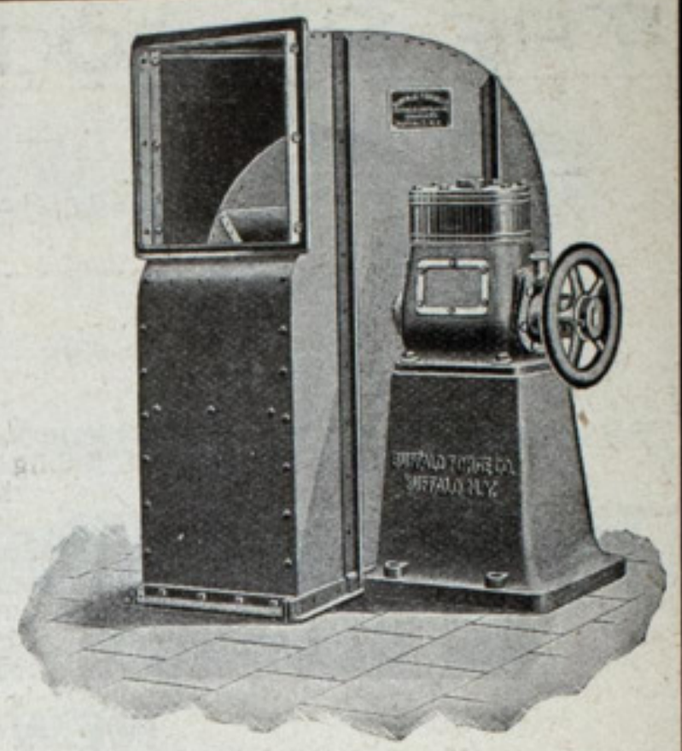

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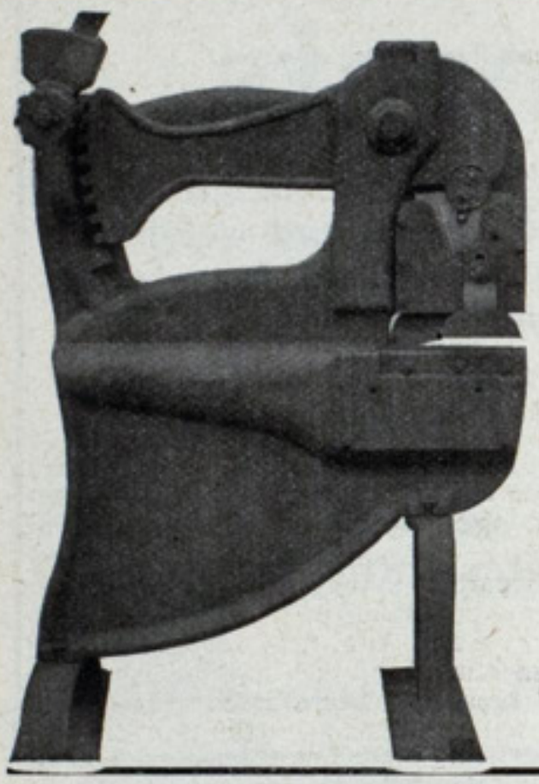

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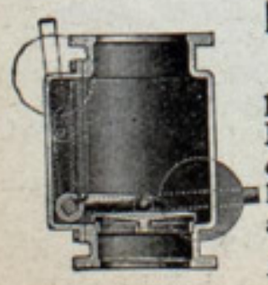

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